SERVICE REFERENCE BOOK

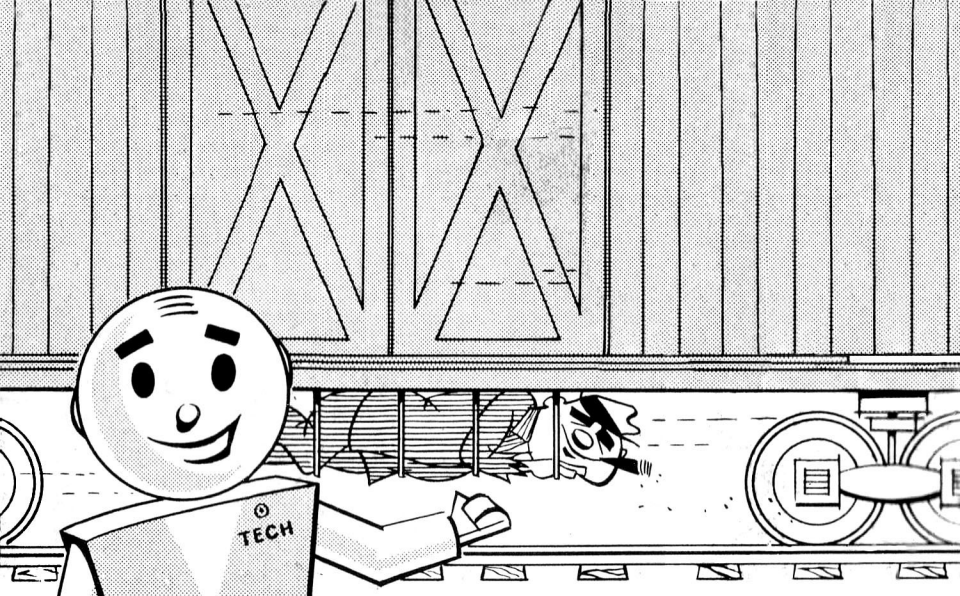
of the MASTER TECHNICIANS SERVICE CONFERENCE

session no. 133

FRONT and REAR SUSPENSION SERVICE

PREPARED BY CHRYSLER CORPORATION

Plymouth • Dodge • De Soto • Chrysler • Imperial



Tech sez:

"THERE'S A LOT THAT HANGS ON THE SUSPENSION SYSTEM!"

On today's heavier cars, failure to follow specifications when adjusting front wheel alignment or rear suspension height can make a *big* difference. Ease of handling, riding comfort, stability on curves and at all speeds, effective braking, tire life . . . all depend on accurate suspension adjustment.

So this reference book outlines the new front suspension adjusting procedure, and the air spring suspension height adjustment. In addition, a new camber-caster specifications chart is provided, together with practical suggestions designed to make your job easier.

Here's your page index to all this useful information:

FRONT SUSPENSION

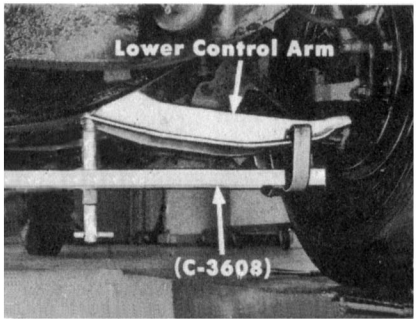
Before any attempt is made to check camber and caster angles, certain preparations must be made. Tires must be properly inflated, for example. Front wheel bearings must be properly adjusted, and the steering linkage and suspension parts inspected for loosness or damage. Front suspension specifications must be checked with the car empty, and with the gas tank full. If the tank is not full, you must add weight to the luggage compartment at the rate of six-and-one-half punds for each gallon of gasoline missing.

car must be [illegible] fore checking caster. It must be lev[illegible] from [illegible] ut also from side to side. And, the spri[illegible] b[illegible] or [illegible] est. Bounce the car about six times by pusi[illegible] at t[illegible] of the front bumper, and releasing it on a [illegible] istroke. Do the same at the rear bumper, using the same number of strokes. Engineers sometime call this, "shaking the friction out of the springs".

Leveling the car from side to side is very important because of its effect on the camber angle which, of course, has a direct relation to ease of handling. Therefore, the first actual checking operation on the car suspension, after the preliminary steps have been completed, is a check of front suspension height.

Check Front Suspension Height

Checking front suspension height is actually a check of torsion-bar tension adjustment. The difference in height between the inner and outer ends of the lower control arm provides an easy-to-measure standard of spring tension as well as equal left- and right hand adjustment. You check the difference in height with a Height and Level Gauge (C-3608) which measures the vertical distance from the underside of the lower ball joint to the lower control arm bushing housing. This distance varies with the different models or body styles, as shown on the next page, for the "M" Series.

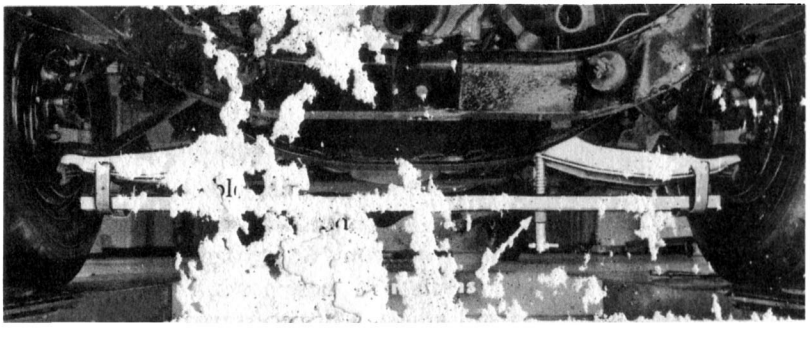


MODEL	FRONT SUSPENSION HEIGHT
SEDANS, COUPES	2⅛" ± ⅛"
ALL SUBURBANS, CARS WITH HEAVY-DUTY FRONT SPRINGS	2½" ± ⅛"
ALL CARS WITH AIR SPRINGS (EXCEPT IMPERIAL)	1⅞" ± ⅛"
IMPERIAL WITH AIR SPRINGS	2⅛" ± ⅛"

How to Use the Gauge. First, be sure the lower control arm ball joints and control arm bushing housings are clean. Accurate gauge readings depend on it! Then, before you attach the gauge, retract the measuring pins and lock them in retracted position.

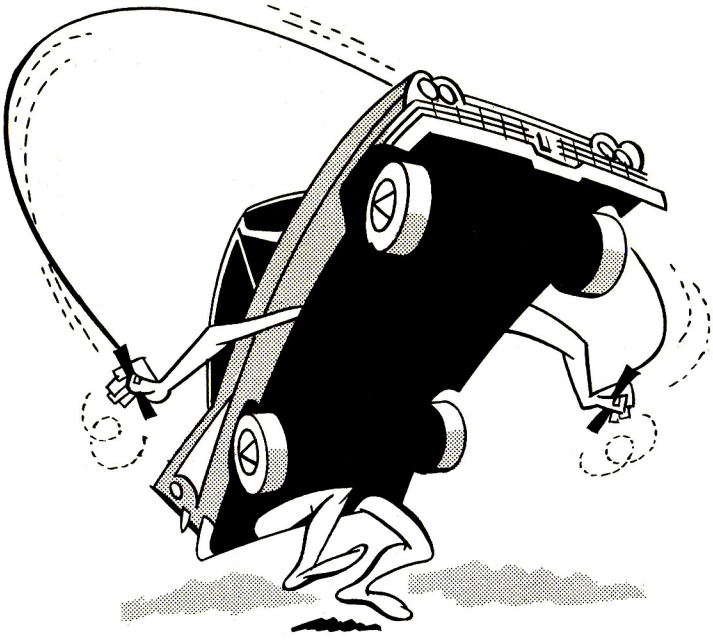
As you attach the gauge to the lower control arms, see that the stops at the outer ends fit tightly against the ball joints. Also, make sure the retaining springs snap over the lower control arm flanges to make contact with the ball joints.

Now release the measuring pins so they'll contact the lower surface of the control arm housings. The springloaded measuring pins, with [illegible] a direct measurement.



If either side doesn't meet specifications, or if there is *more* than ⅛" difference between measurements at the right and left sides, you'll have to change height by making an adjustment at the torsion bars. To change height, turn the adjusting bolts at the torsion-bar anchors. Turning the bolt clockwise raises the car: counterclockwise, lowers the car.

Watch the gauge measuring pins as you adjust the anchor bolts to tell when you're within specifications. Adjusting one side affects the other, so you'll have to adjust both sides. Bounce the car again, front and rear, and take new readings to recheck the adjustment. If it is okay, you're ready to check caster and camber.



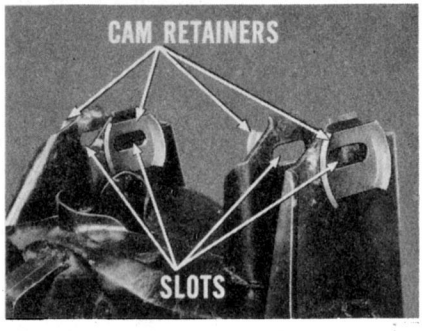
NOTE: Rear height, remember, affects caster angle. While this is true of all cars—with or without springs—rear height on air-sprung cars is *adjustable*. In these cases, then, rear height should be checked and adjusted (if necessary) *before* you try

to adjust camber or caster. Rear height on air-sprung jobs is also affected by front suspension height. When you check front alignment on air-sprung cars, you must follow this special service sequence: adjust front height *first,* and then the *rear.* Then recheck front height before you tackle caster or camber adjustment.

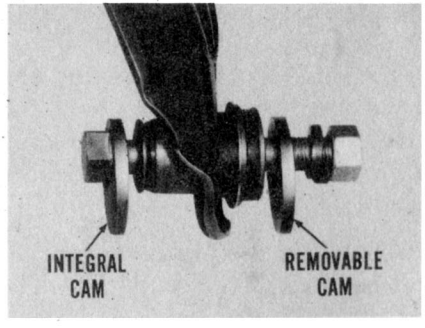
Adjust Camber and Caster

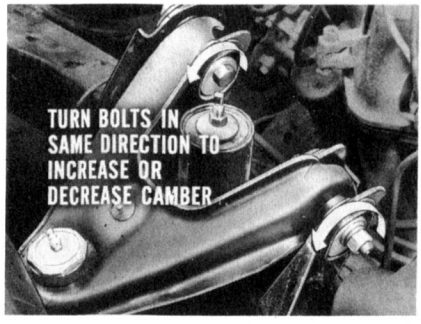
Most of you know that camber and caster adjustments on the "M" Series cars are made by turning the front and rear mounting bolts of the upper control arms. Cams have replaced the shims formerly used to make these adjustments. As a reminder, let's review the design changes that make cam adjustment possible.

Each upper control arm is attached to support brackets, which have cam retainers welded to their outer faces. Horizontal slots are provided for adjusting bolt movement.

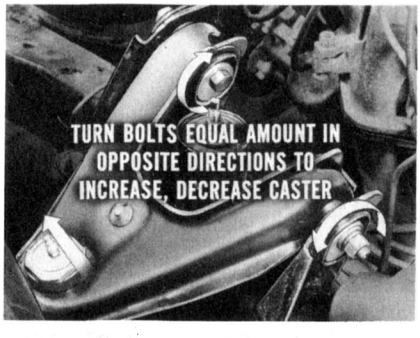


Integral cams are welded under the head of each bolt. Matching, removable cams are on a flat at the threaded end.





Turning both the front and rear adjusting bolts an equal amount in the *same* direction moves the upper control arm in or out. This increases or decreases *camber*.



Turning each bolt an equal amount, but in opposite directions, moves the ball-joint end of the upper control arm fore or aft. This increases or decreases *caster*.

Caster-Camber Checking and Adjustment. A caster-camber adjusting procedure that can be used with all types of front end alignment equipment follows. It simplifies the job by eliminating all caster readings while making adjustments. Only the original reading and a final one are needed to make sure that final caster setting is correct.

Let's assume that suspension height is correct, tires properly inflated, and the car's been leveled by bouncing the bumpers. Also, you have the car set up on the equipment you have in the shop. It's a car equipped with power steering, and you are about to check camber of the right wheel.

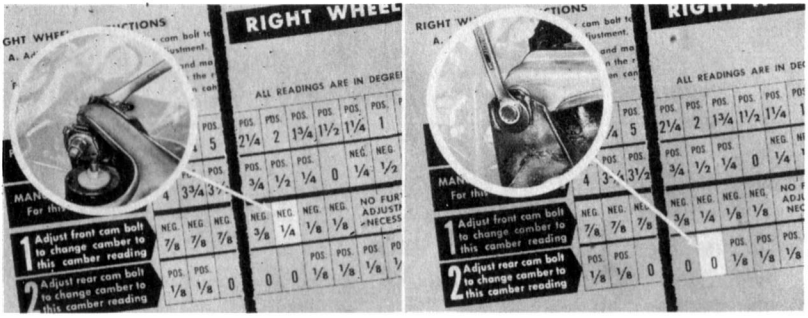
Right Wheel Adjustment. Specifications, in this example, state that camber should be positive ¼° to negative ¼°, with 0° preferred. But let's say you read a camber of positive ½°. In a case like this,

you'd turn either the front or the rear adjusting bolt until you get a reading of 0°. In other words, you'd turn the bolt to bring the top of the wheel inward.

Tighten the lock nut to hold that camber adjustment and then take a caster reading. Let's say you get a caster reading of positive 2°. This is greater than specifications allow: caster should be 0 to positive 1½° on *power steering* cars, with positive ¾° preferred. On *manual steering* cars, caster should be 0 to negative 1½°, with negative ¾° preferred.

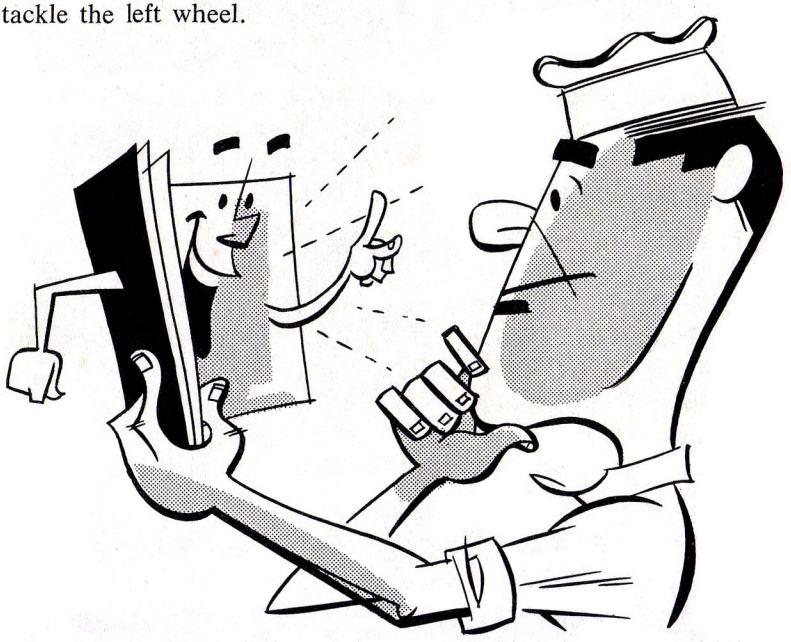
To make the adjustment that will bring right wheel caster back to specifications, all you have to do is consult the Caster-Camber Correction Chart on pages 12 and 13. It tells what to do to correct caster, and keep camber within limits.

In our example, remember, you're working on the right wheel and you've set camber at 0°. According to the chart, when you get a caster reading of positive 2° on the right wheel of a power steering car, you're supposed to adjust the *front* bolt to get a camber reading of negative ¼°. Go ahead and make that adjustment, and then tighten the lock nut to hold it. The chart then says to adjust the *rear* bolt until camber reading is 0°. So, do that, and tighten the lock nut to secure the adjustment. Camber is now 0°, which is what you wanted for the final setting.



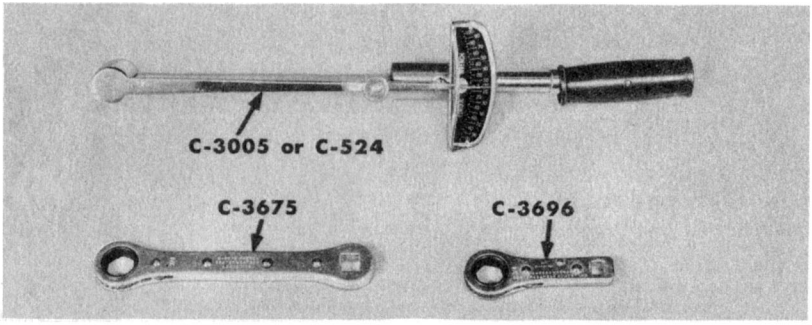
NOTE: Other charts are available to help you do this job. In our example, however, we'll refer only to the chart just mentioned.

Tighten the adjusting bolt lock nuts to 65 foot-pounds torque. Hold the bolts while tightening the nuts so the cams won't turn. Then go back and recheck your angles to be sure they didn't change during the tightening. If the adjustment hasn't changed, you're ready to tackle the left wheel.

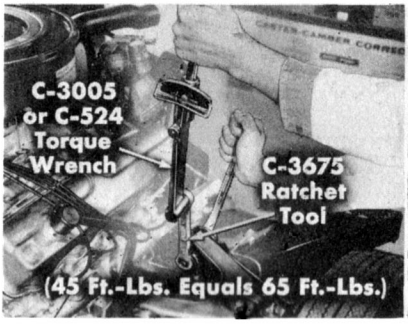


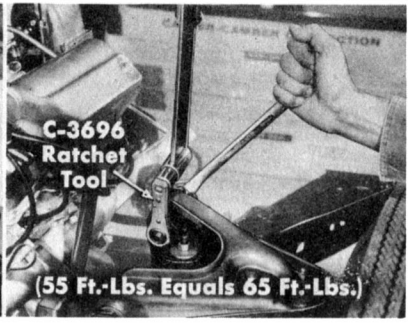
Go through the same steps on the left wheel that you did on the right. Follow the chart and you won't go wrong.

NOTE: Specifications for *left wheel camber* are 0° to +½°, with ⅜° preferred. On equipment used at most dealerships it is almost impossible to read ⅜° accurately. The procedure and chart for left wheel adjustment, therefore, is based on the more practical camber reading of +¼° as an initial setting.



Use Special Tools Available. On most models it is impossible to put a torque wrench on the adjusting bolt nuts. So, you'll have to use the C-3005 or C-524 torque wrench, and this new C-3675 ratchet tool. With that combination, a torque reading of 45 foot-pounds on the wrench will be the same as the specified torque or 65 foot-pounds at the nut.





On some Chrysler cars equipped with several accessories, you'll have to use a shorter C-3696 ratchet tool. When you use this tool, you tighten the lock nut to a torque reading 55 foot-pounds on the wrench to get the specified 65 foot-pounds at the nut.

NOTE: Don't overtighten the lock nuts. That can damage the ratchet tool as well as the upper control arm brackets.

CASTER-CA[illegible]B [illegible]

RIGHT WHEEL INSTRUCTIONS

A. Adjust either the front or rear cam bolt to obtain a zero camber reading. Tighten the cam bolt locknut to hold this adjustment.

B. Measure caster. To correct ***caster*** and maintain camber within limits, change camber by adjusting first the front and then the rear cam bolt to obtain the camber readings specified in the chart below. Tighten cam bolt locknut after each adjustment.

POWER STEERING: For this caster reading	POS. 5½	POS. 5¼	POS. 5	POS. 4¾	POS. 4½	POS. 4¼	POS. 4	POS. 3¾	POS. 3½	POS. 3¼	POS. 3	POS. 2¾	2½
MANUAL STEERING: For this caster reading	POS. 4	POS. 3¾	POS. 3½	POS. 3¼	POS. 3	POS. 2¾	POS. 2½	POS. 2¼	POS. 2	POS. 1¾	POS. 1½	POS 1¼	PO
1 Adjust front cam bolt to change camber to this camber reading	NEG. ⅞	NEG. ⅞	NEG. ⅞	NEG. ⅞	NEG. ¾	NEG. ¾	NEG. ⅝	NEG. ½	NEG. ½	NEG. ½	NEG. ½	NEG. ½	NE
2 Adjust rear cam bolt to change camber to this camber reading	POS. ⅛	POS. ⅛	0	0	0	0	0	POS. ⅛	POS. ⅛	0	NEG. ⅛	NEG. ⅛	0

LEFT WHEEL INSTRUCTIONS

A. Adjust either the front or the rear cam bolt to obtain positive ¼ degree camber. Tighten the cam bolt locknut to hold this adjustment.

B. Measure caster. To correct ***caster*** and maintain camber within limits, change camber by adjusting first the front and then the rear cam bolt to obtain the camber readings specified in the chart below. Tighten cam bolt locknut after each adjustment.

POWER STEERING: For this caster reading	POS. 5½	POS. 5¼	POS. 5	POS. 4¾	POS. 4½	POS. 4¼	POS. 4	POS. 3¾	POS. 3½	POS. 3¼	POS. 3	POS. 2¾	POS. 2¼
MANUAL STEERING: For this caster reading	POS. 4	POS. 3¾	POS. 3½	POS. 3¼	POS. 3	POS. 2¾	POS. 2½	POS. 2¼	POS. 2	POS. 1¾	POS. 1½	POS 1¼	
1 Adjust front cam bolt to change camber to this camber reading	NEG. ⅝	NEG. ⅝	NEG. ⅝	NEG. ⅝	NEG. ½	NEG. ½	NEG. ⅜	NEG. ¼	NEG. ¼	NEG. ¼	NEG. ¼	NEG. ¼	NE
2 Adjust rear cam bolt to change camber to this camber reading	POS. ⅜	POS. ⅜	POS. ¼	POS. ¼	POS. ¼	POS. ¼	POS. ¼	POS. ⅜	POS. ⅜	POS. ¼	POS. ⅛	POS. ⅛	PO ¼

RRECTION

RIGHT WHEEL SPECIFICATIONS

CAMBER: Positive ¼ to negative ¼ degree, zero camber preferred.

CASTER: POWER STEERING: Zero to positive 1½ degrees, positive ¾ degree preferred.
MANUAL STEERING: Zero to negative 1½ degrees, negative ¾ degree preferred.

	NEG. ¼	NEG. ½	NEG. ¾	NEG. 1	NEG. 1¼	NEG. 1½	NEG. 1¾	NEG. 2	NEG. 2¼	NEG. 2½	NEG. 2¾	NEG. 3	NEG. 3¼	NEG. 3½	NEG. 3¾	NEG. 4
	NEG. 1¾	NEG. 2	NEG. 2¼	NEG. 2½	NEG. 2¾	NEG. 3	NEG. 3¼	NEG. 3½	NEG. 3¾	NEG. 4	NEG. 4¼	NEG. 4½	NEG. 4¾	NEG. 5	NEG. 5¼	NEG. 5½
OS ¼	POS. ¼	POS. ¼	POS. ⅜	POS. ⅜	POS. ½	POS. ½	POS. ½	POS. ⅝	POS. ⅝	POS. ⅝	POS. ¾	POS. ¾	POS. ⅞	POS. 1	POS. 1	POS. 1
POS ⅛	0	0	0	0	POS. ⅛	0	0	POS. ⅛	0	0	0	0	0	POS. ⅛	POS. ⅛	0

LEFT WHEEL SPECIFICATIONS

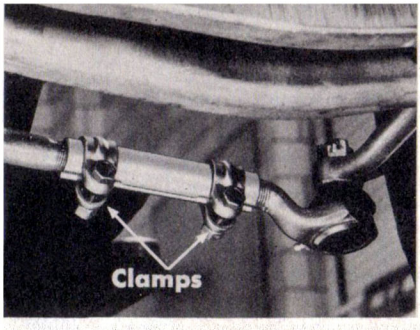
CAMBER: Zero to positive ½ degree, positive ⅜ degree preferred.

CASTER: POWER STEERING: Zero to positive 1½ degrees, positive ¾ degree preferred.
MANUAL STEERING: Zero to negative 1½ degrees, negative ¾ degree preferred.

	NEG. ¼	NEG. ½	NEG. ¾	NEG. 1	NEG. 1¼	NEG. 1½	NEG. 1¾	NEG. 2	NEG. 2¼	NEG. 2½	NEG. 2¾	NEG. 3	NEG. 3¼	NEG. 3½	NEG. 3¾	NEG. 4
	NEG. 1¾	NEG. 2	NEG. 2¼	NEG. 2½	NEG. 2¾	NEG. 3	NEG. 3¼	NEG. 3½	NEG. 3¾	NEG. 4	NEG. 4¼	NEG. 4½	NEG. 4¾	NEG. 5	NEG. 5¼	NEG. 5½
	POS. ½	POS. ½	POS. ⅝	POS. ⅝	POS. ¾	POS. ¾	POS. ¾	POS. ⅞	POS. ⅞	POS. ⅞	POS. 1	POS. 1	POS. 1⅛	POS. 1¼	POS. 1¼	POS. 1¼
⅛	POS. ¼	POS. ¼	POS. ¼	POS. ¼	POS. ⅜	POS. ¼	POS. ¼	POS. ⅜	POS. ¼	POS. ¼	POS. ¼	POS. ¼	POS. ¼	POS. ⅜	POS. ⅜	POS. ¼

Adjust Toe-in

Toe-in adjustment is still made the same way as on previous models, and to the same specification . . . ⅛". Before you tighten the tie rod clamp bolts, make sure the steering wheel is centered. Also, see that clamp bolts are on the underside where they won't cause any interference. In addition, position the ends of the tie rods in the sockets so that both studs are against either the front or back sides of the sockets, then tighten the clamp bolts from 10 to 15 foot-pounds. This provides sufficient angular rotation of the tie rod on the ball studs and prevents interference on extreme turns.



While toe-in procedure and specifications haven't changed, the importance of toe-in adjustment hasn't diminished. It must be set correctly or steering and tire life will be seriously affected.

REAR SUSPENSION AIR SPRINGS

Description

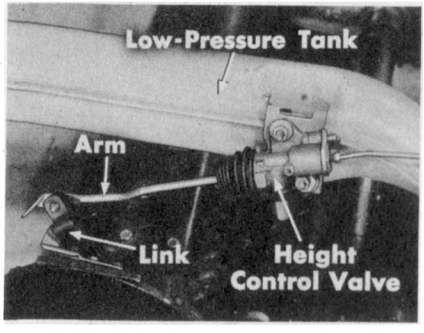
The rear suspension air spring system available on the "M" Series cars consists of a compressor, a high-pressure tank, a low pressure tank, two air springs, plus the necessary connecting lines and a height control valve.

The system functions as an auxiliary to the regular leaf springs, and is intended to keep the rear of the car level with the front, regardless of the load placed in the car.

When the car is empty, air springs support about 300 pounds of the total weight on the rear axle. As the load increases, either from

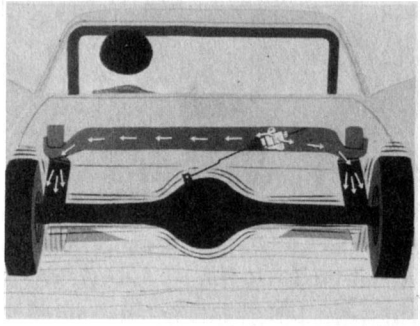
added passengers or luggage, the additional weight is carried by the air springs.

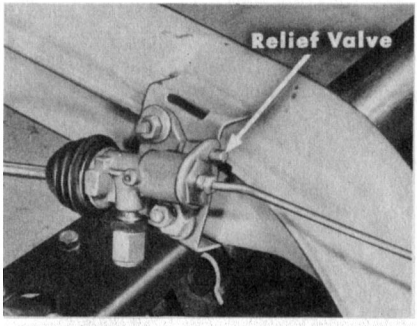
Any pressure changes required by the air springs because of load variations are automatically controlled by a bleed-feed type of height control valve. This valve is attached to the low-pressure tank mounted on the frame. The actuating arm of the valve is connected to the rear axle by means of a flexible rubber link. When the car is heavily loaded, the valve *admits more air* to the springs. The car therefore maintains its proper height. When the load is reduced and the body tends to rise, the valve *bleeds air* from the springs. This lets the body return to its normal height. So, in spite of changes in load, car height is almost constant.



NOTE: Remember to give the valve time to do its leveling job. This will take from two to three minutes. The rate of air bleed and feed is purposely slowed down by an orifice in the height control valve, so the increase or decrease in air pressure in the air springs takes place gradually rather than instantaneously. This keeps the valve from trying to compensate for momentary changes in car height due to normal bumps and dips in the road and interfering with normal soft action of the leaf springs which would cause a harsh, uncomfortable ride.

In general, the two air springs and low-pressure tank act as one single spring of large capacity. Pressure in both air springs is always equal. If an owner tosses all his gear and heavy luggage on one side of the trunk or rear seat, such a severe one-sided load will not be leveled out. The system is just intended to keep the rear level with the front.





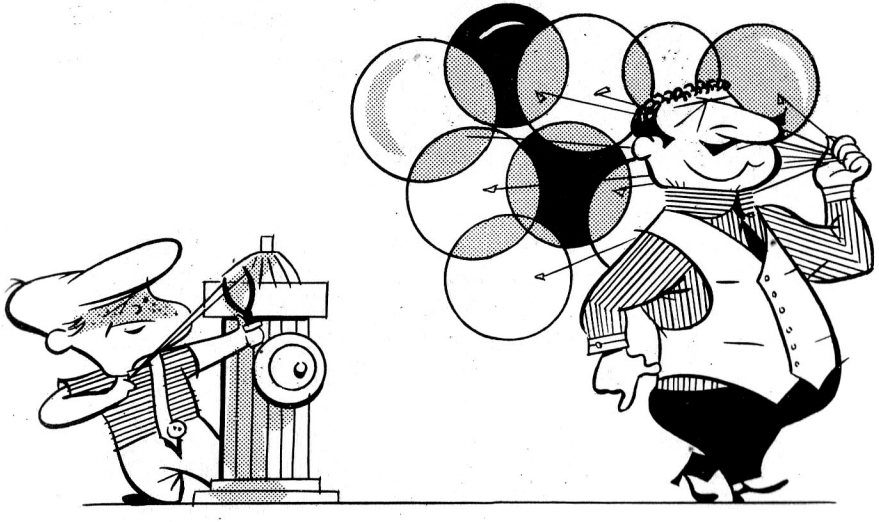
An air-sprung car, though, will take a load equal to the weight of nine average-size people. This is about 1200 to 1500 pounds, maximum. But overloading won't damage the system. It will trigger a relief device in the control valve, which is set to blow off at about 150 psi.

The body will settle down slowly and warn of the overload. The body won't come up to normal

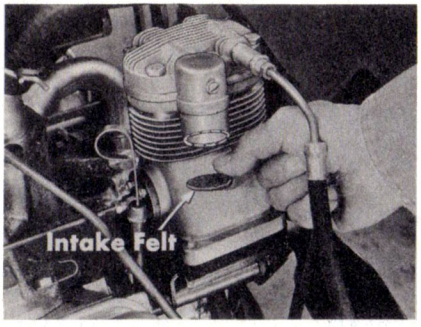
height until the overload is removed. This blow-off feature which functions as a safety device, lets the valve reseat at about 110 psi.

Maintenance

Drain the Tank. In any compressed air system, moisture tends to collect in the high-pressure tank. Excess water reduces tank capacity. If it is allowed to accumulate, it can be blown through the control valve and into the low-pressure tank, reducing capacity there. In cold climates, it can freeze and cause damage. So water in the system must be removed periodically. Every month, then, depress the tire-type valve at the bottom of the high-pressure tank to drain the moisture. Just depress the valve as though you were bleeding air from a tire. Hold it in until all the moisture is removed.



CAUTION: Never remove the valve to drain the tank, unless all air pressure has been released. Trying to remove any fitting from the system while it is under pressure can damage threads, or cause personal injury. The only safe way to release pressure before servicing any part of the system is to depress the drain valve stem.



Check Intake Felt. About every 5,000 miles, check the air compressor intake felt. If it's dirty, replace it. This keeps the air clean and prevents clogging of compressor and control valve passages.

Here's another point. To keep the air springs firmly seated at the low-pressure tank and pistons when the car is jacked up for a rear tire removal, a minimum of 8 to 15 psi is required. Normally, the low-pressure tank will maintain the minimum. If the system is known to have a leak, or has been bled for servicing, run the engine for a few minutes before jacking up a rear wheel.

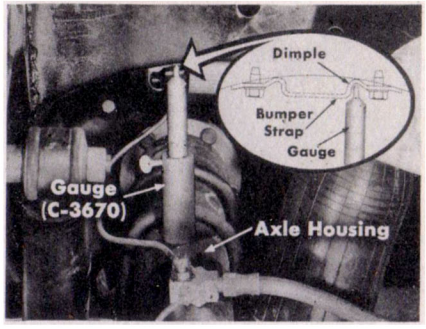
Adjust Rear Suspension Height. Occasionally, it may be necessary to check or adjust rear suspension height. To check rear height and see if the height control valve is properly adjusted to keep height within specifications, you must first check axle-to-frame height with a load in the trunk. Next, you check height with the load removed to see if the valve compensates correctly for the load change. Then you compare average *loaded* with average *unloaded* height to see if valve action is up to specifications which are based on average height. Details on this entire procedure follow.

Put the car on a level floor. Inflate tires to proper pressures, and see that the gas tank is full or has weight added (6½ lbs. per gallon)

to make up for any lack of gas. Add 150 to 200 pounds in the center of the luggage compartment. Next, start the engine and run it about 2,000 r.p.m. for five minutes to bring the air system up to normal pressure.

NOTE: While the engine's running, clean off all foreign material from the axle near the "U" bolts and bumper straps where measurements will be made.

Use the rear suspension height gauge (C-3670) to measure the distance from the axle housing to the dimple in the bumper strap on the frame—on each side. Both sides should measure the same within ½", or one leaf spring is probably weak. On a new car, chassis paint or initial interleaf friction may cause a difference in height greater than ½". So, before removing a rear spring, drive the car over a fairly rough road to shake down rear springs, shackles, and shock absorbers. Also, recheck front height as it affects rear height. Spring removal to correct unequal height should be a last resort.

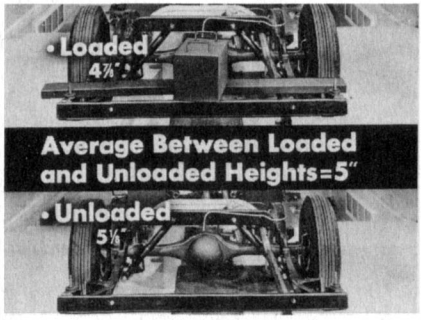


As an example, if you measure 4¾" on the left, and 5" on the right, that would be okay because it's within ½". In this same case, average height would be the average of both measurements, or 4⅞". This is the loaded height.

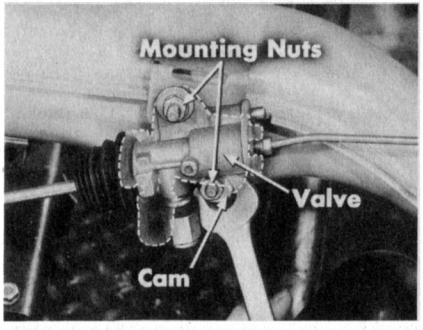
Now, to check unloaded height, remove the weight from the luggage compartment. Again, because of the restricted air flow, wait about three minutes for the control valve to adjust to unloaded

height. Then take measurements again. If you get 5″ on the left side, and 5¼″ on the right, it will still be okay because that's still inside the ½″ tolerance. Average unloaded height, in this case, is 5⅛″.

To determine how to adjust the control valve, find the average between loaded and unloaded heights. The average between 4⅞″ and 5⅛″ is exactly 5″. **Specifications call for 4¾″, plus or minus ⅛″ on all models but the Imperial. Imperials should be 4⅜″ with the same tolerance.** The average of 5″ in this example is too high, so the valve would need adjustment. Here's how that's done.

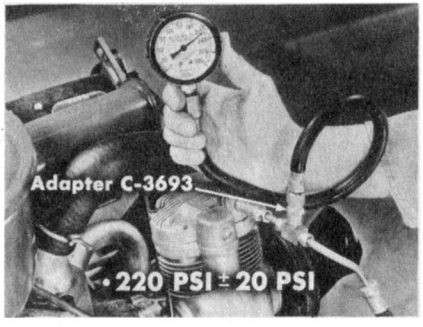


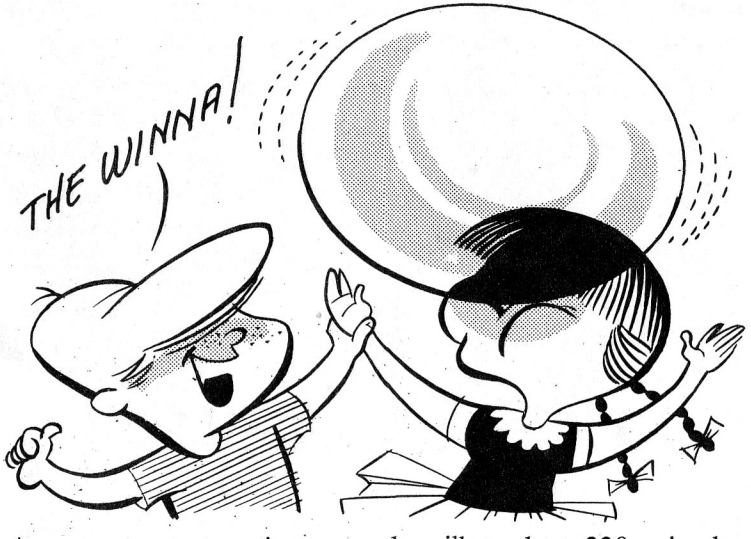
Loosen both valve mounting nuts slightly so the valve can be moved. Adjust the control valve *cam* to rotate the valve in a *clockwise* direction. This will enable the valve to reduce the controlled height. Hold the cam while you tighten both mounting nuts to exactly 100 inch-pounds. Do not get them any tighter. Then go through the complete loaded and unloaded checks to see if the valve is now controlling the springs at the proper height.



Incidentally, a tolerance of ½″ between the average loaded and unloaded figure is allowed on a new car. After the car's been in service, a tolerance of ¾″ is allowed. If you find a valve that won't control the average loaded and unloaded height inside those limits, the valve has too much lost motion and should be replaced.

Test Compressor Output. To test compressor output, first discharge the air. Next, install an adapter tool (C-3693) between the air line and check valve. In the adapter, install a 300-psi gauge (C-3293) and start the engine. Run the engine at about 2000 r.p.m. and check gauge pressure.





A compressor operating properly will produce 220 psi, plus or minus 20 psi, at 1800 to 2000 r.p.m. If you get less than that, check for one of the following possible causes:

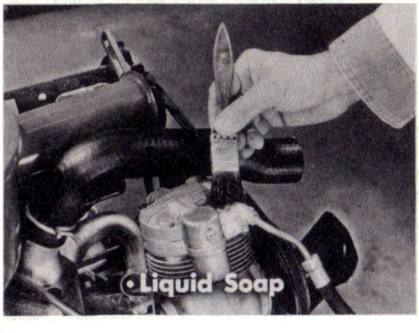
- a plugged check valve
- a cracked cylinder head or valve plate gasket
- defective, or worn valve reeds
- excessive cylinder wall and ring wear
- a slipping drive belt

Tension specifications for the air compressor drive belt are 40 ft.-lbs. or 5/16" deflection on new belts: 30 ft.-lbs., or 9/16" deflection on used belts. A used belt is one that's been run 15 minutes or more.

If you get more than 240 psi, there might be an excessive carbon build-up in the compressor. Excessive oil on top of the compressor pistons may also cause too much pressure.

Test Check Valve. If there's a pressure drop every time the car parks for any length of time, the check valve may be letting pressure bleed back into the compressor. Or, there might be an external line or fitting leak that lets air escape to atmosphere. Testing the check valve is easy. Just discharge the system and remove the valve. Apply air pressure to the outlet side. If it leaks, replace the valve.

Inspect For Air System Leaks. To find possible leaks in the system, take a tip from the gas man who often traces leaks. Brush liquid soap over all seams, joints, connections, the drain valve, air springs and seats, and the height control valve mounting. When the engine runs and the system's full of air, any leak will show in the form of a bubble at the escape point.



SUMMARY

Remember . . . failure to follow specifications when adjusting the front or rear suspension system can affect handling, ride, safe braking, and tire wear—all conditions which the owner will quickly recognize. So, for his peace of mind—and yours—be sure that all suspension adjustments are within specifications. That's the best way to keep your customers sold on your product *and* service.


IN PERFECT BALANCE!