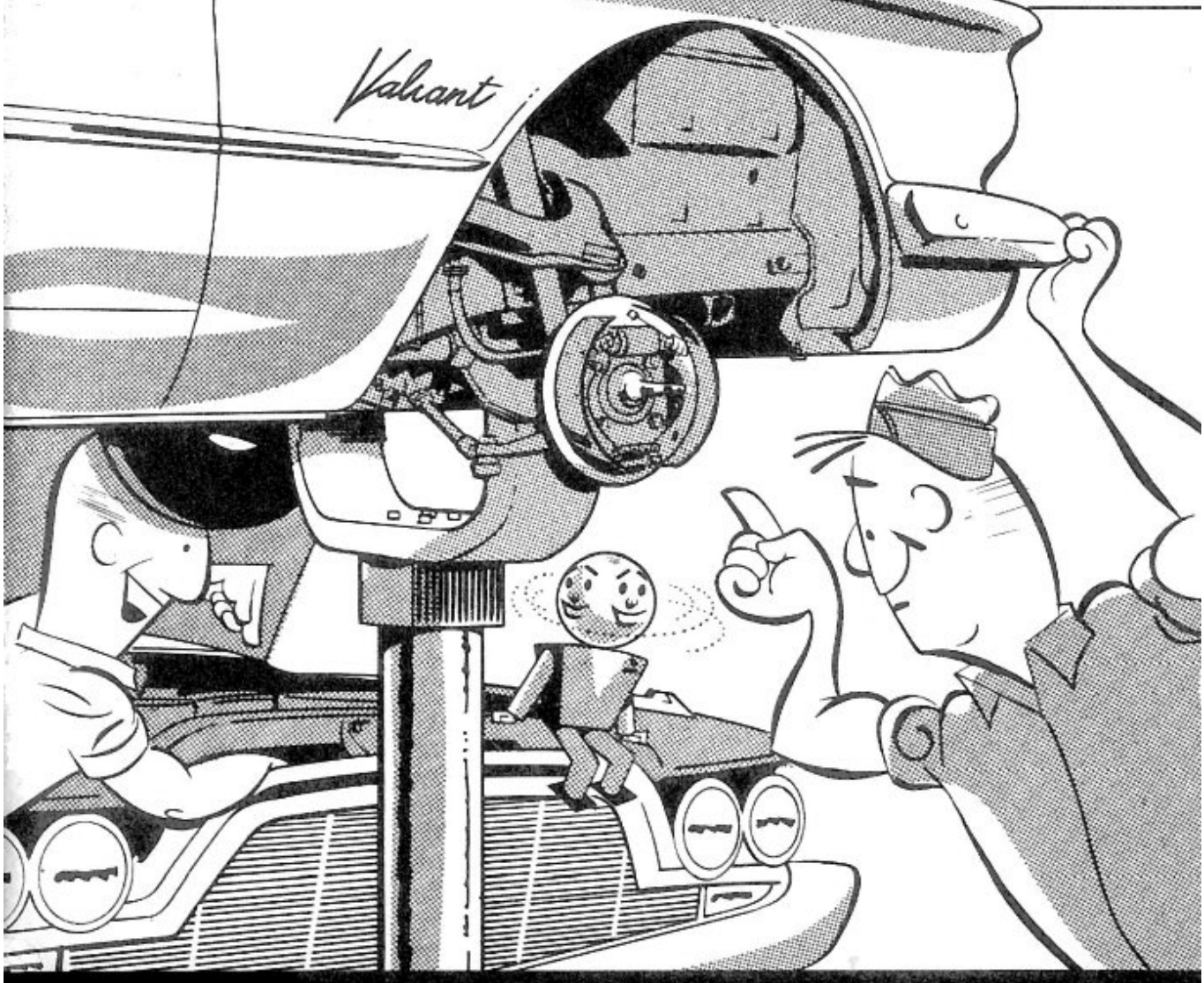
SERVICE REFERENCE BOOK

of the MASTER TECHNICIANS SERVICE CONFERENCE

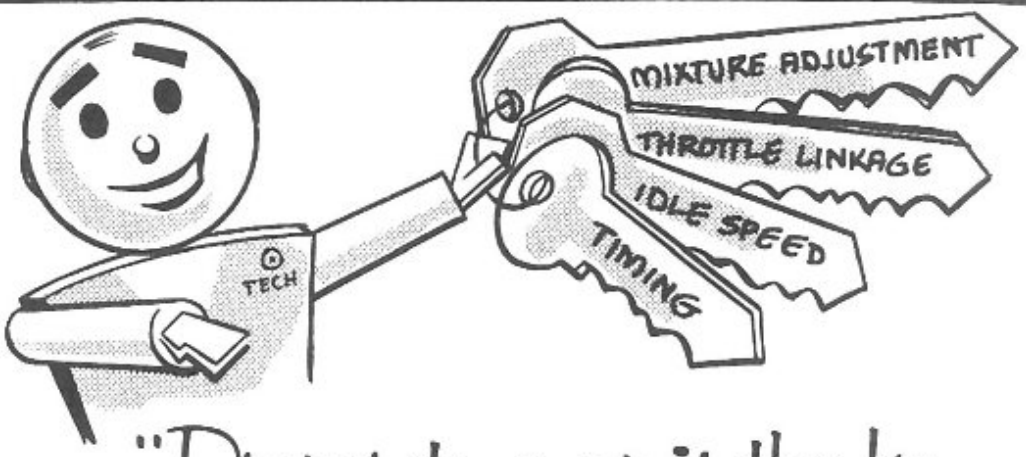
session no. 147

RAM INDUCTION FUEL SYSTEM and VALIANT BRAKES



PREPARED BY CHRYSLER CORPORATION

Dodge • Plymouth-De Soto-Valiant • Chrysler and Imperial Divisions



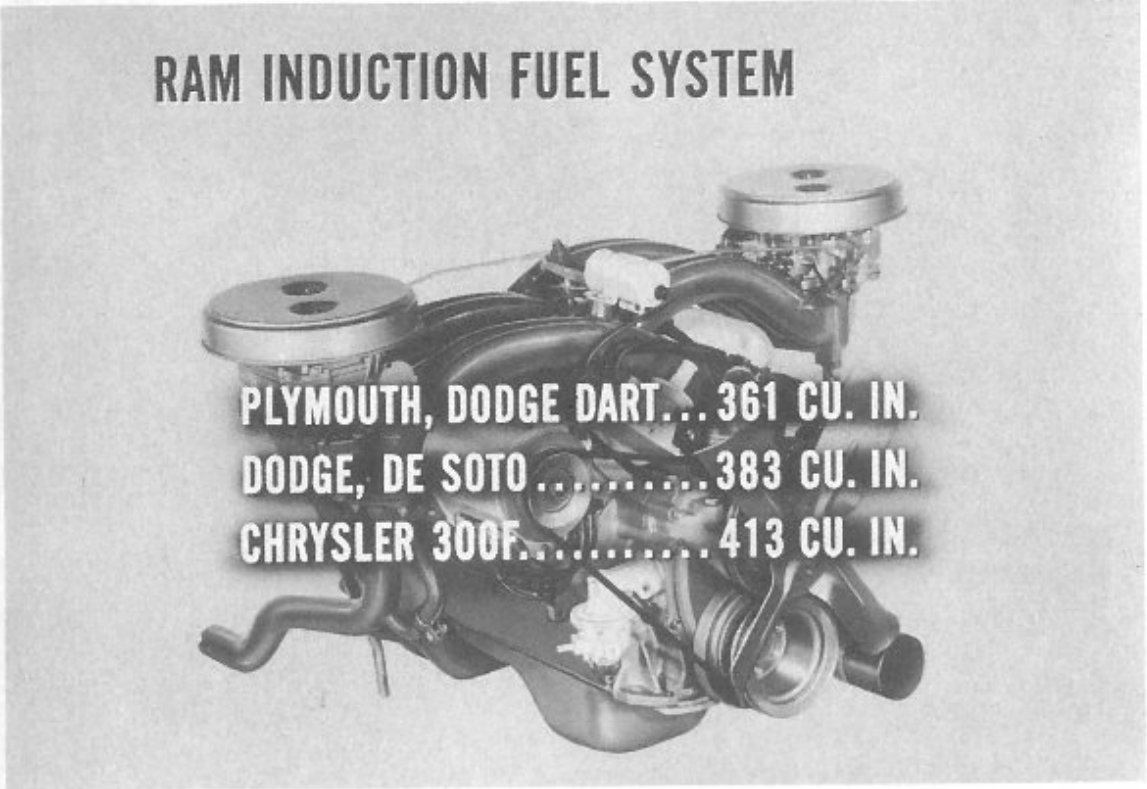
Tech sez: "Proper tune-up is the key to peak Ram-Induction performance"

An out-of-tune engine and an out-of-tune orchestra have one thing in common. Neither can perform at its best until each unit is properly tuned up. On engines equipped with the new Ram Induction fuel system, proper tune-up is especially important.

You'll find tune-up easy to do as long as you follow the prescribed procedure outlined in this reference book. There's nothing complicated about it, but there are no short-cuts. Each step must be performed carefully, and in its proper sequence. What, when, and how to make these adjustments is spelled out in detail.

This book also contains a description of the new Valiant brakes, how they operate, and how they should be maintained. Here's your handy guide to all of this useful service information:

RAM INDUCTION FUEL SYSTEM

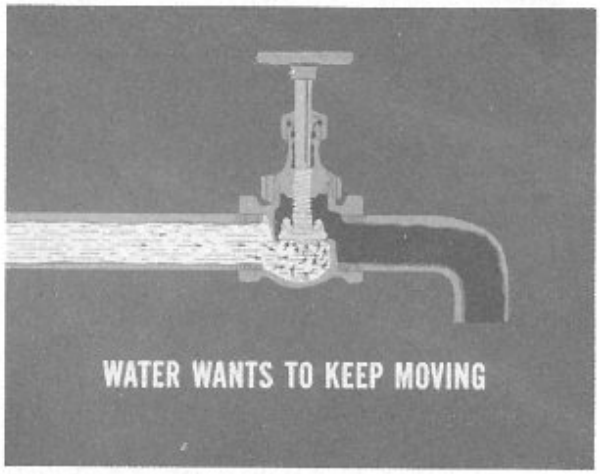


Most technicians know that the ram induction fuel system is optional on a Plymouth or Dodge Dart equipped with the 361-cubic inch engine, and on a Dodge or De Soto with the 383-cubic inch engine. They also know that ram induction is standard on the Chrysler 300F model that sports the 413-cubic inch engine. It is fairly common knowledge, too, that ram induction involves the use of two 4-barrel carburetors. Each carburetor has its own automatic choke, air cleaner, manifold heat control valve, and aluminum intake manifold.

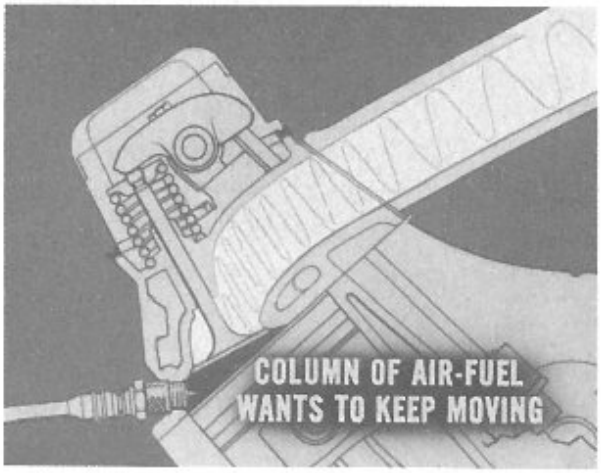
But not every technician knows that the ram induction fuel system is the greatest engine development since the supercharger was introduced! In this system the air-fuel mixture is rammed into the engine when the throttle opens to provide instant, powerful acceleration at highway passing speed.

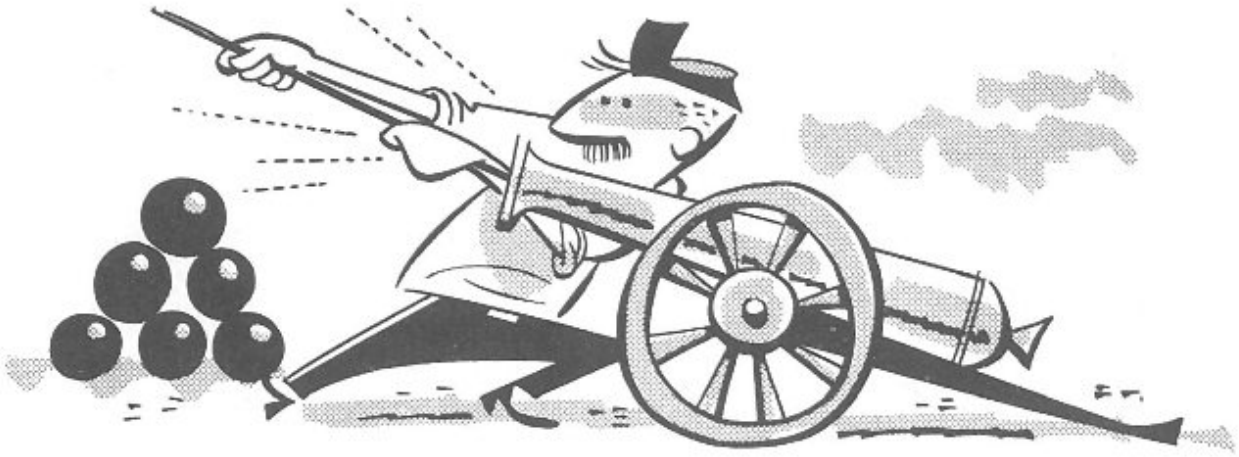
Unlike a supercharger, the ram induction system involves no moving parts that can get out of adjustment. Neither does it use a blower that requires power from the engine for its operation.

How It Works. Ram induction, instead, makes use of mass inertia and resonance effects in a manifold passage of carefully controlled length. That may sound complicated, but it's actually easy to understand. As an example . . . when a column of water moves through a pipe, it wants to keep moving even after you turn the faucet off. It might even make a hammering sound as it piles up against the valve.

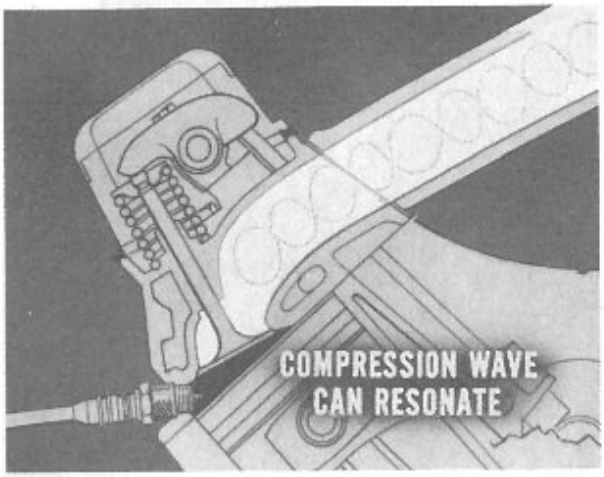


In almost the same manner, the column of air and fuel in one of the long ram manifold passages wants to keep moving even after the intake valve closes. This rams fuel mixture up against the valve where it's ready to charge the cylinder the instant the valve opens.



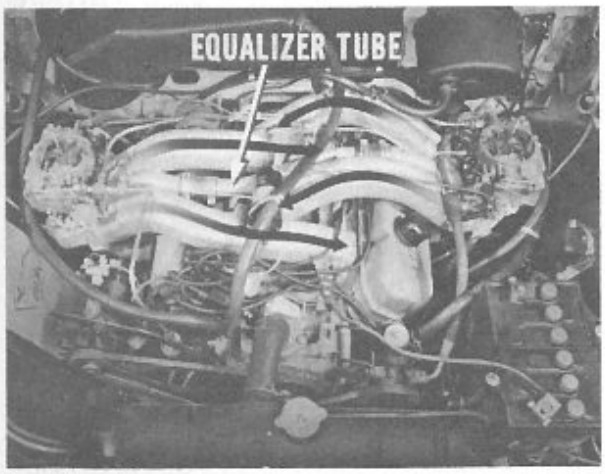


Now, each long branch, in principle, is like an organ pipe in which a compression wave can resonate—travel back and forth—at the speed

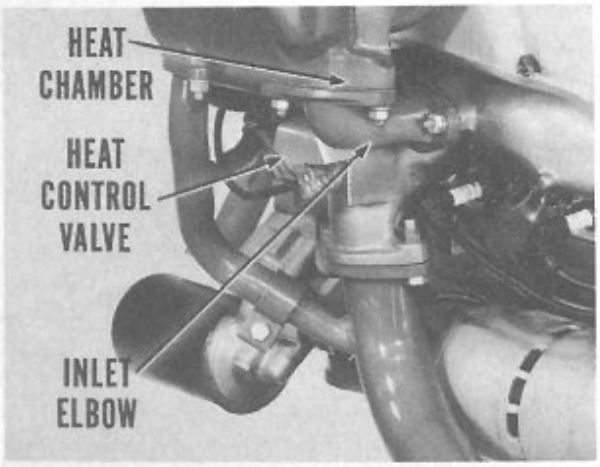


of sound. The length of each passage has been carefully engineered to take advantage of this tendency. Each passage, in other words, must be long enough so that the compression wave is at the valve when it opens. Then the compressed mixture will be rammed into the cylinder the instant the valve opens.

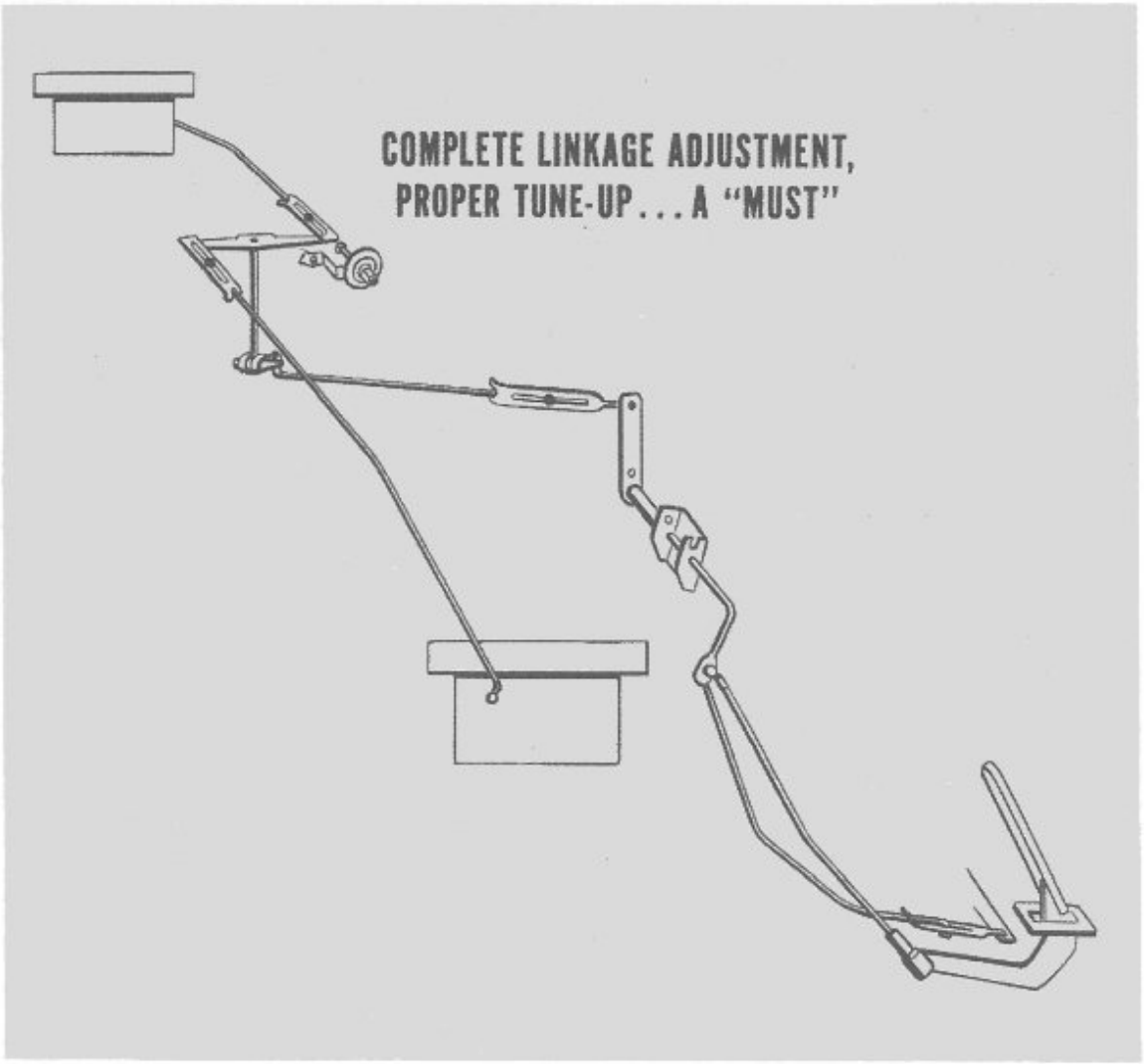
A pressure equalizer tube is located between the two intake manifolds. This tube connects the right and left manifolds to maintain the vacuum balance and bring about a smoother engine operation.



The carburetor and manifold arrangement of the ram induction fuel system is unusual. The carburetor on the right supplies air-fuel mixture to the cylinders in the left bank. The carburetor on the left feeds the cylinders in the right bank.



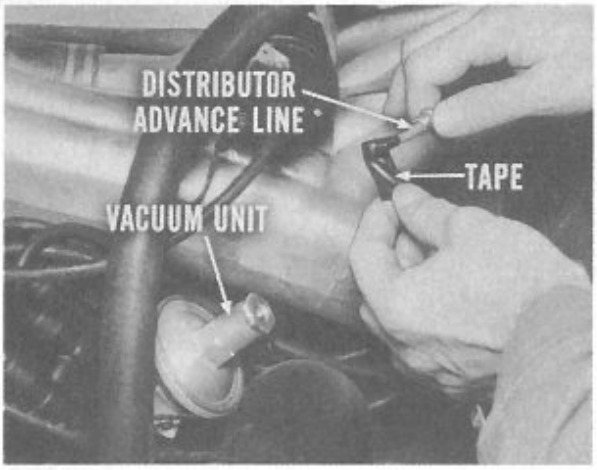
Each exhaust manifold has its own heat control valve. Hot exhaust gases, piped through a heat inlet elbow to a heat chamber under the intake manifold, help vaporize the mixture and provide a quicker warm-up. Make sure that both valves work freely and do not stick or bind.



Both carburetors are controlled by linkage that operates through a center-mounted bell crank. If you remove one carburetor, or both of them, or remove either intake manifold, be sure to make a complete linkage adjustment when you reassemble the job. That, along with the proper tune-up, is a "must" for peak engine performance!

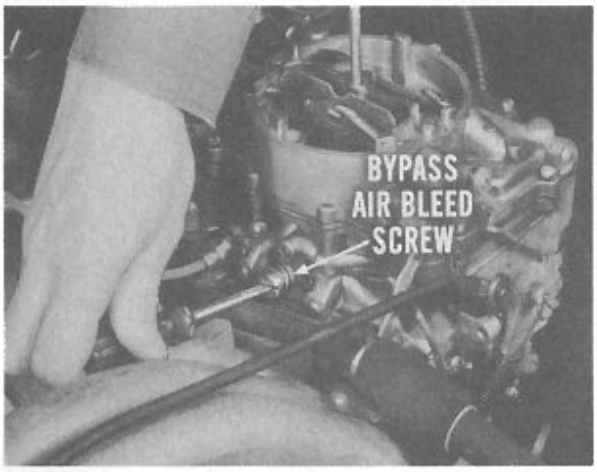
ENGINE TUNE-UP

Proper tune-up means there's a recommended procedure to follow. Each step must be done in its proper sequence for the best possible



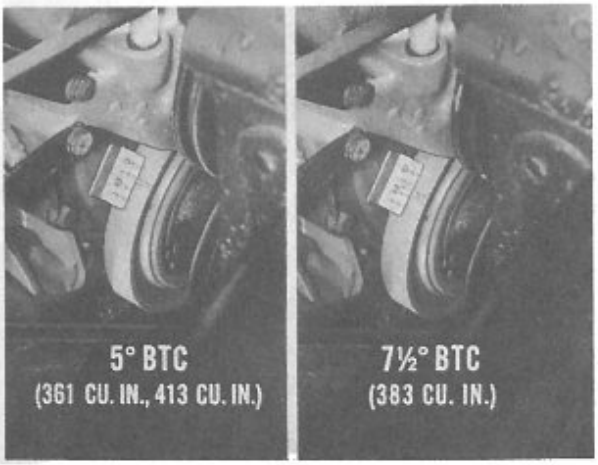
results. The first step in proper tune-up of the ram induction engine is to disconnect the distributor vacuum advance line at the vacuum unit. Tape the end of the line.

Idle Speed. Start the engine and let it run at fast idle until it reaches normal operating temperature. Both choke valves at that time should be wide open. With a reliable tachometer, set engine idle at 600 r.p.m.



Engine idle speed adjustment is set by turning the bypass air bleed screw on each carburetor. This bypass screw takes the place of the former idle speed adjusting screw.

Timing. Ignition timing must be set accurately or the quality of engine idle will suffer, and performance in the higher speed ranges will be considerably below standard. "Close enough" is not good enough for these engines —timing must be exact! So connect a timing light and set timing at 5° BTC on the 361-cubic inch and on the 413-cubic inch engines. Set timing at 7½°



BTC on the 383-cubic inch engine. When you finish, turn off the ignition and disconnect the timing light.

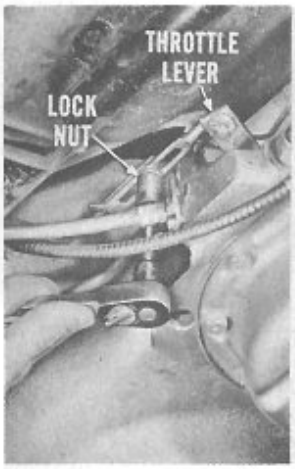
Once timing is set with the vacuum line disconnected, you won't have to change it. So take the tape off the advance line and reconnect the line to the distributor.

NOTE: Remember that if you read timing *after* the vacuum line has been connected, you'll read *basic timing* plus *full vacuum advance* along with *some mechanical advance.* That could give you an incorrect reading, because engine ignition timing must be set at idle speed with *no* automatic advance. If a technician didn't understand this, he might set timing back—thinking he'd made a mistake. The engine, under driving conditions, would then operate with timing actually too late.

Throttle Linkage. After setting the timing, adjust the throttle linkage. This adjustment is, perhaps, the most important of the tune-up procedures. It not only controls engine performance, but transmission performance as well. Incorrect linkage adjustment could be responsible for poor wide-open throttle response, delayed transmission shifts, no forced kickdown, and so on.

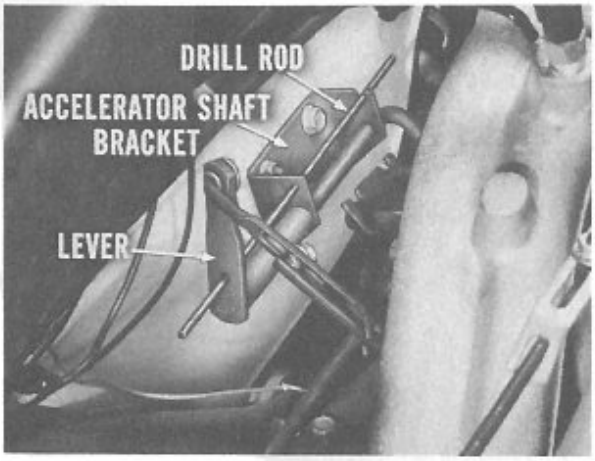
There are five steps involved in adjusting the throttle linkage and they must be done in this particular order:

(1) Position the accelerator shaft
(2) Position the accelerator pedal
(3) Adjust the bell crank
(4) Adjust the accelerator-to-bell-crank rod
(5) Adjust the anti-stall device

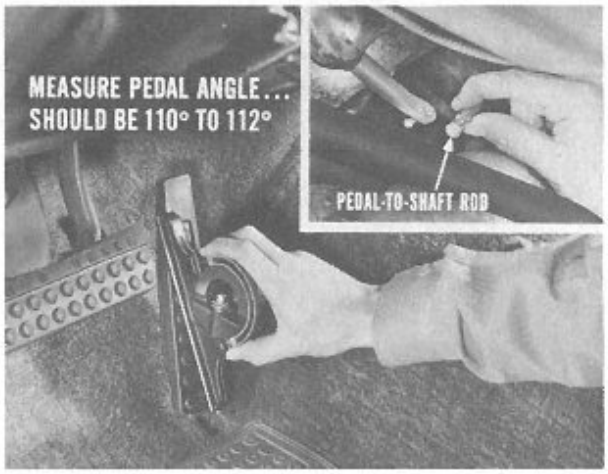


(1) Position Accelerator Shaft. This first step begins under the car. You loosen the rod lock nut at the transmission throttle lever. Then – in the engine compartment–you loosen the lock nut on the two-piece throttle rod.

Next, you insert a piece of $\frac{3}{16}$" drill rod, about 10" long, into the accelerator shaft bracket and through the hole in the lever. This locks the lever in position. Move the transmission throttle lever forward to its stop. Tighten the rod lock nut securely and the accelerator shaft is properly positioned in relation to the transmission throttle lever.

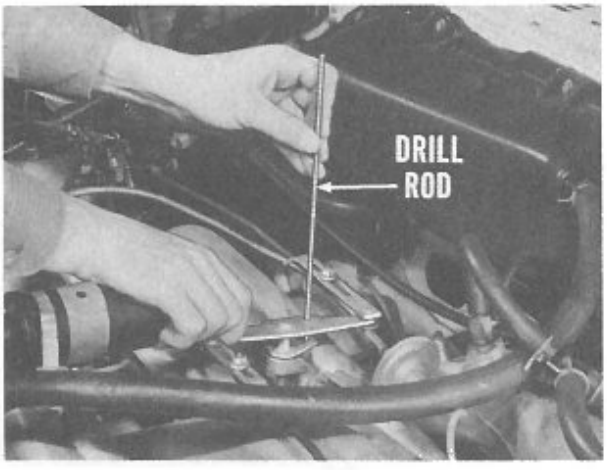


(2) Position Accelerator Pedal. You can leave the drill rod in place for this second step. With a protractor, measure the pedal angle. It should be 110° to 112°. Just turn the threaded end of the accelerator pedal-to-shaft rod to get the right angle. Remove the drill rod.



You can also adjust the pedal another way. In this case, though, remove the drill rod. Then, adjust the pedal at the ball joint to get a full throttle opening *before* the pedal touches the floor mat.

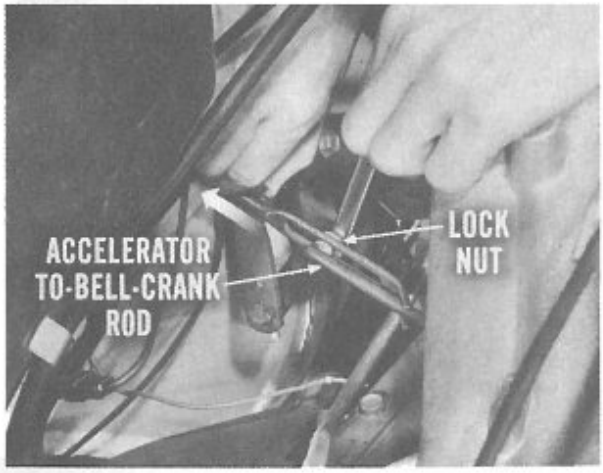
(3) Adjust the Bell Crank. On engines that have the two-piece carburetor throttle rods, loosen the lock nuts. Loosen the anti-stall device mounting screw so the unit can swing down out of the way. Pivot the bell crank until the hole near its center lines up with the locating hole in the manifold. Lock the bell crank in position by inserting the $\frac{3}{16}$" drill rod through the bell crank and into the manifold.



Make sure both choke valves are open, both fast idle cams are released, and both throttle valves are closed. Then tighten the lock nuts, and remove the piece of drill rod from the bell crank.

NOTE: Some early models were not equipped with two-piece throttle rods. On these cars, disconnect the rods at the bell crank. Adjust the length of the rods by turning the ends until the carburetor throttle valves are fully closed when the rods are connected to the bell crank.

(4) Adjust the Accelerator-to-Bell-Crank Rod. This step must be done with the carburetor throttle valves at curb idle position. Push the rear portion of the accelerator-to-bell-crank rod rearward to the stop (the lock nut was loosened when the transmission throttle lever was set). Then, tighten the lock nut. Work the linkage several times and look for signs of interference with adjacent parts.

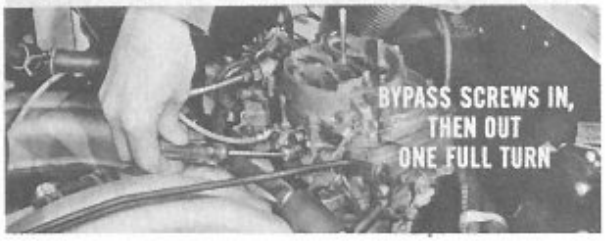


Before you leave these rods, inspect for interference between the projecting ends of the two-piece rod and the left-hand air passages. Dress down the projections, if necessary, to provide ample clearance.

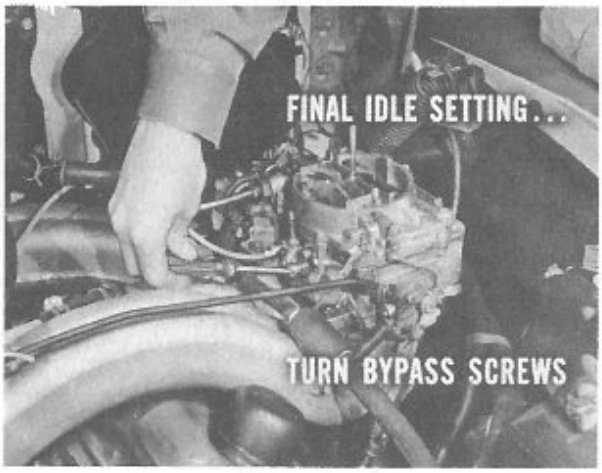
(5) Adjust the Anti-Stall Device. For this adjustment, the engine must be at normal operating temperature. Idle should be set at 725 to 750 r.p.m. The transmission should be in Neutral and the parking brake should be applied. On cars with air conditioning, turn off the compressor. That takes the load off the engine.

Have a helper apply the foot brake and press in the "D" button. Reposition the anti-stall device. Then, using two wrenches, *turn* the plunger *toward the bell crank* to get a clearance of .005" to .010". Finally, turn off the ignition. That completes the throttle linkage adjustment.

Idle Speed and Mixture Adjustment. After adjusting the throttle linkage, you're ready to make the idle speed and mixture adjustment. Work the throttle linkage first, though, to make sure that both carburetors return to idle position at the same time. Then, turn *in* all four mixture screws *finger-tight*. Turn each screw *out* ¾-turn. Turn the bypass idle air bleed screws *in* until they seat. Then, turn them *out one full turn*. Those are approximate settings, and serve as the starting point for final adjustment. Now, start the engine. When it reaches normal operating temperature, make final idle mixture adjustments. Turn the left carburetor idle mixture screws ⅛-turn at a time until you get the smoothest setting. Turn each screw an equal amount. Do the same on the right-hand carburetor.



Make the final idle speed setting by turning the bypass air bleed screw on each carburetor. Turning the screw *in* produces a *richer* mixture. Turning it *out* produces a *leaner* mixture. As the bypass

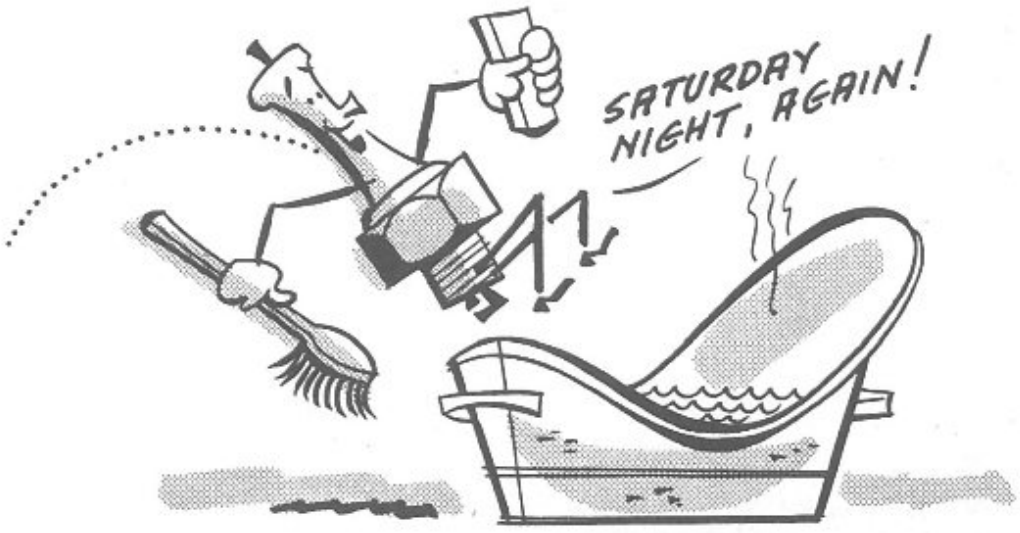


screws are turned, the mixture ratio will change slightly. You might have to readjust the mixture screws for smooth idle operation. What you're after is the specified tachometer reading. Also, you must keep both bypass screws at *exactly equal* openings.

OTHER SERVICE TIPS

Spark Plug Fouling. Occasionally, you might encounter a case of spark plug fouling. This can happen on a high-performance engine, naturally, if the engine is used extensively at low speeds, or if it runs at slow idle too much of the time. It's the *operation,* then, and not the plugs that causes fouling. Engines with the ram induction fuel system use A-32 spark plugs for the best performance. So, use no other spark plugs—especially those of a hotter range. Hotter range plugs can damage a high-performance engine that operates on high-speed runs.

In all cases of fouling, remove the spark plugs. You will find this easier to do when the car is on a hoist. Clean all plugs and respace each one to its recommended .035" gap.

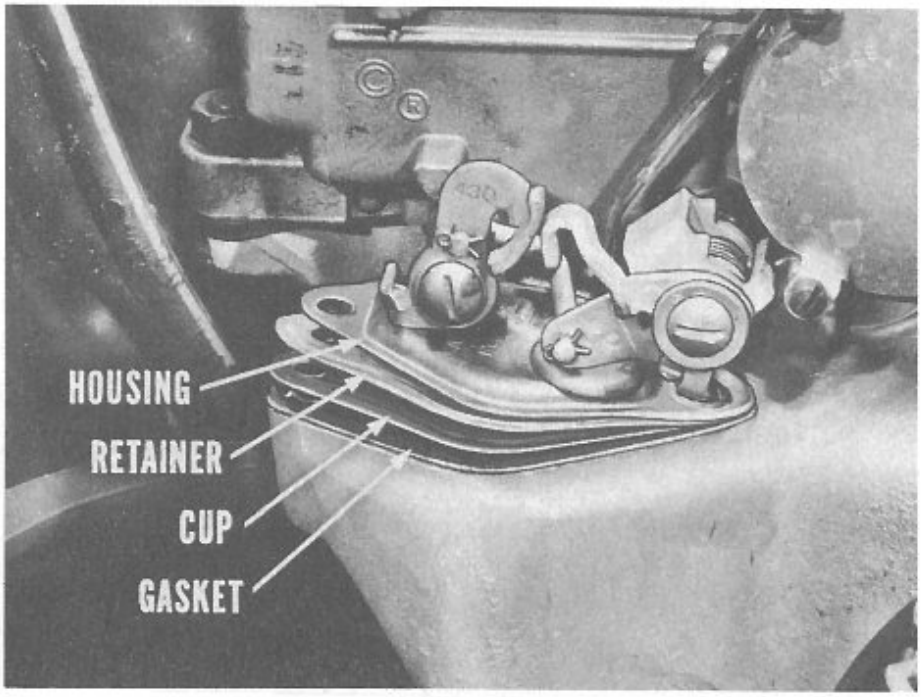


Manifold Heat Control Valve (De Soto). On Plymouth, Dodge and De Soto models, two types of manifold control valve thermostatic coil springs are used. Early production cars used a seven-coil spring (Part No. 960003), while later models use a stronger, five-coil spring (Part No. 2128933). Using the stronger spring helps hold the valve closed longer. This increases temperature of the intake manifold during low- and idle-speed operation.

Automatic Choke Installation. If you should have occasion to install the automatic choke on a ram-manifold-equipped engine, keep this important point in mind. A gasket is used at the choke well to seal exhaust gases in the intake manifold. It must be assembled between the manifold and choke well cup. Unless it is properly in place, an exhaust leak will result.

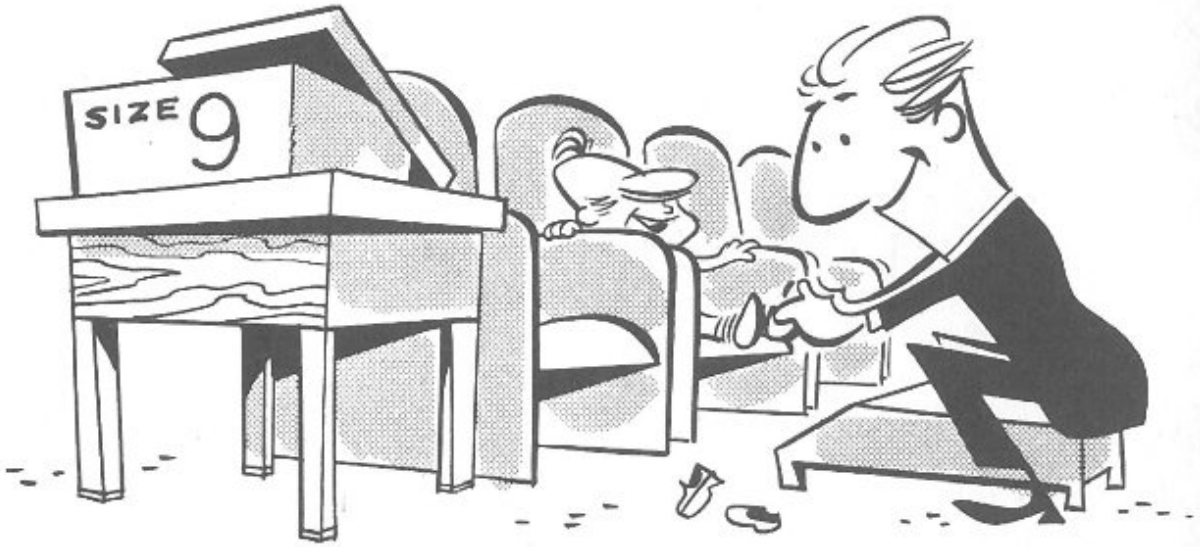
Here's the assembly sequence, therefore, that should be followed:

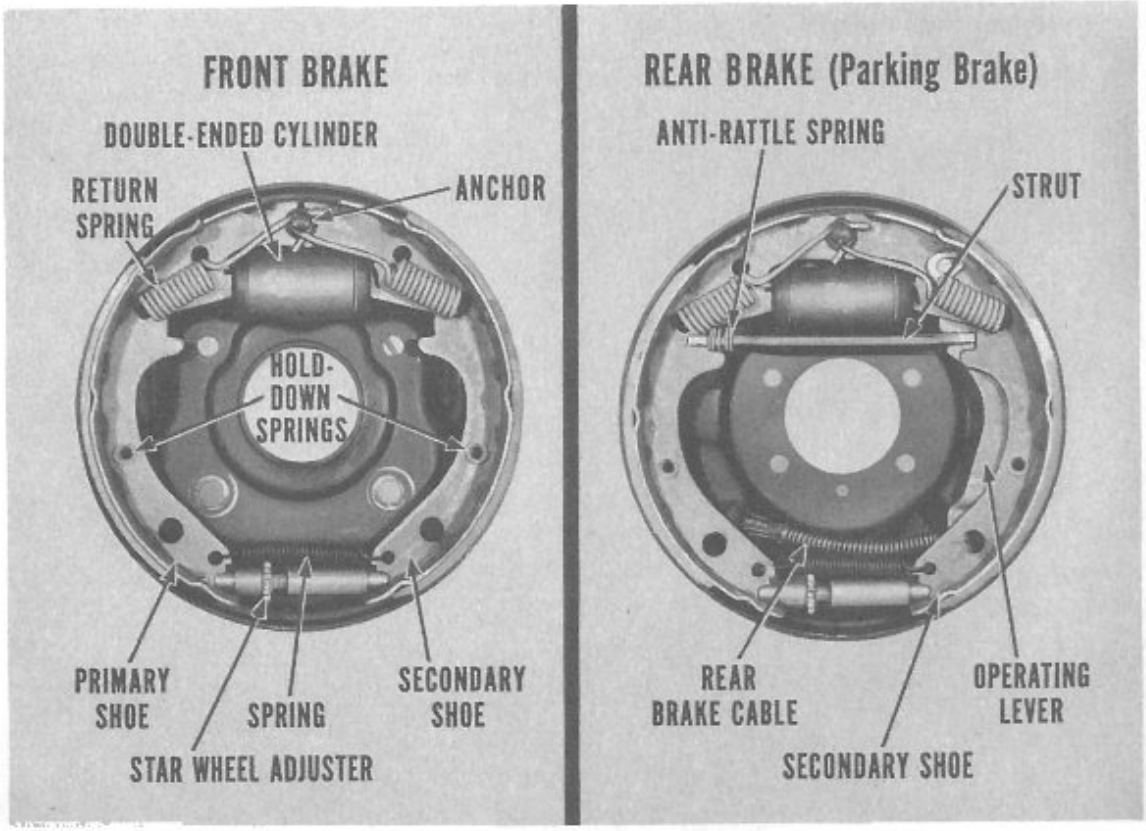
(1) Insert the gasket in the choke coil well;
(2) Install the cup;
(3) Install the retainer; and—
(4) Install the choke coil housing and rod assembly.



VALIANT BRAKES

Description. Some technicians may be familiar with the type of brakes used on the new Valiant models. A larger size of this same type has been in popular use on Dodge low-tonnage trucks.



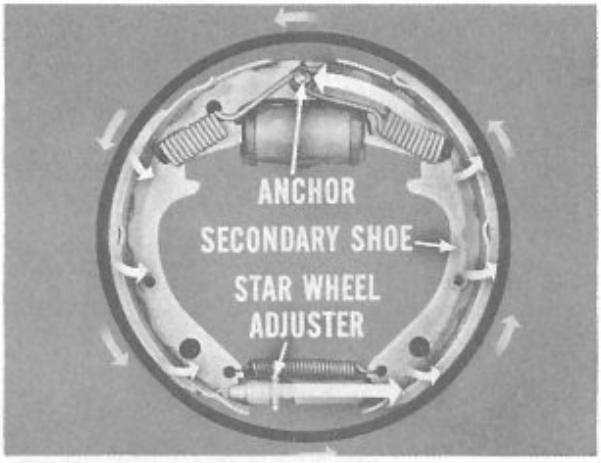


Briefly, these brakes are known as the "Duo-Servo" single-anchor type. They have a front—or *primary*—shoe, and a rear—or *secondary*—shoe. A double-ended wheel cylinder and an anchor are positioned between the shoes at the top of the brake. At the bottom, there's a star wheel adjuster assembly for adjusting the shoes to compensate for lining wear. There's also a shoe hold-down spring arrangement, two shoe return springs, and the backing plate on which the brake parts are mounted.

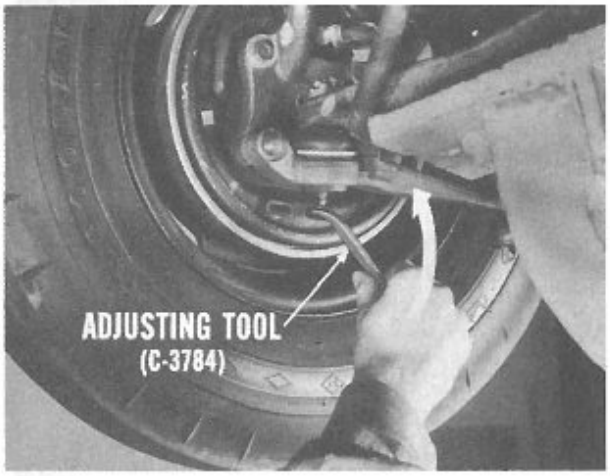
Rear brakes also serve as the parking brake. They are operated through a cable setup connected to a lever that actuates the secondary shoes. In addition, the rear brakes have a strut and a strut anti-rattle spring.

Front brakes use a 2¼" riveted lining on the primary shoe, and a 2½" lining on the secondary shoe. Primary and secondary shoes are interchangeable, since they are drilled with two sets of holes. Rear brake shoes use only 2" linings.

Operation. When the brake pedal is depressed, hydraulic action causes the shoes to move away from the anchor and toward the drum. As the car moves forward, drum rotation moves both shoes, which are free to float, in the same rotational direction. Force applied by the drum to the primary shoe is transferred through the star wheel adjuster to the secondary shoe. This forces the secondary shoe against the anchor. With the anchor serving as a stop, hydraulic pressure — plus the frictional drag of the drum — forces the shoe tightly against the drum. This self-energizing effect, which takes place going forward or rearward, is often called "servo action". That's why the brakes are called "Duo-Servo" brakes.

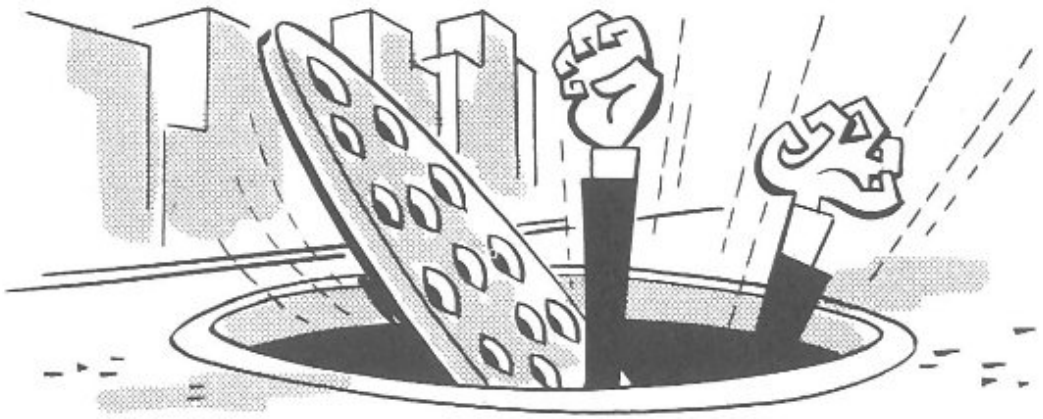


Adjustment. Only one adjustment is needed to bring shoes closer to drums to compensate for lining wear. This is made with the star wheel adjuster. All you do is raise the car on a hoist, or jacks, so the wheels are free to turn. Release the parking brake. Then, with a screwdriver, carefully remove the *forward* adjusting hole covers from the left backing plates, and the *rear* adjusting hole covers from the right backing plates. Insert the adjusting tool (C-3784) through the backing plate and into the star wheel notches. Move the free end of the tool toward the center of the road wheel to tighten the shoes until you can hardly turn the road wheel.



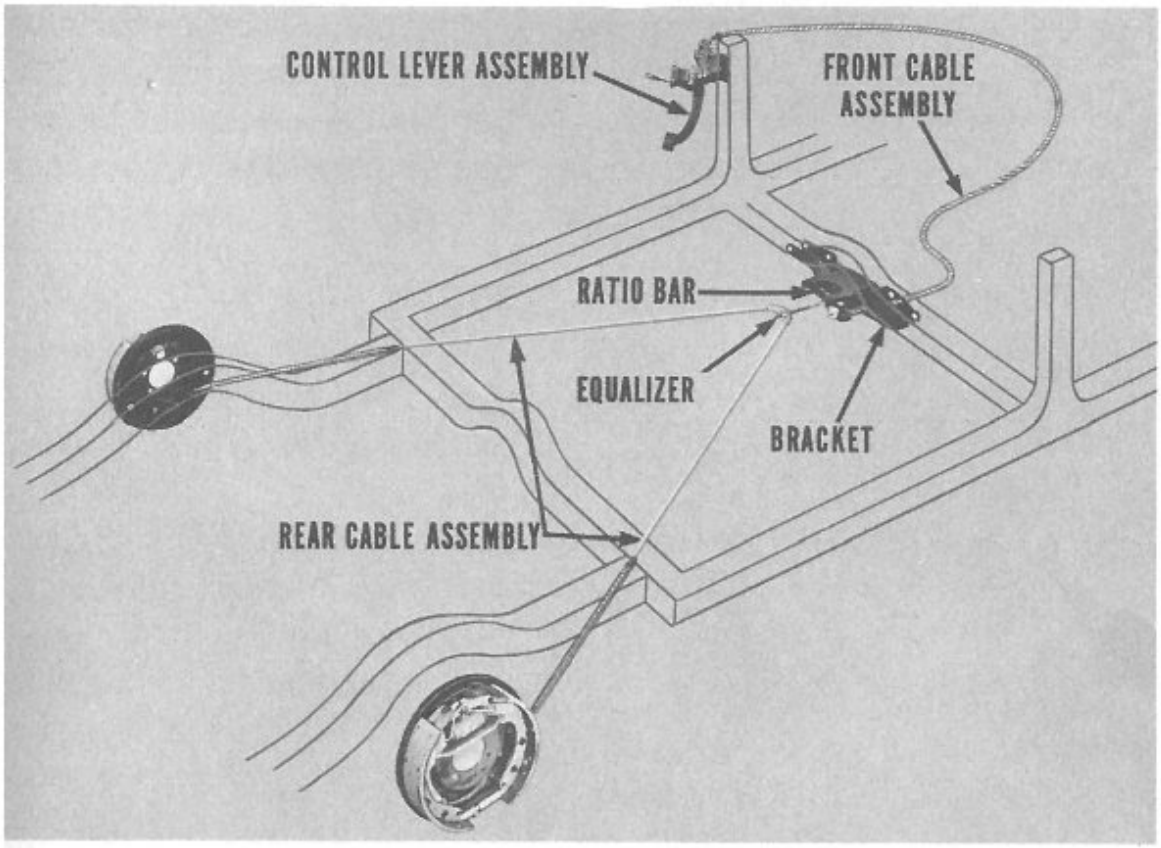
Then, back off the adjustment 12 notches to insure proper lining-to-drum clearance. Recheck rotation of the road wheel for lining drag. Do this at all four wheels and reinstall the adjusting hole covers.

NOTE: When you reinstall the adjusting hole covers, inspect them carefully for damage and replace any that might not seal effectively against dirt and water.

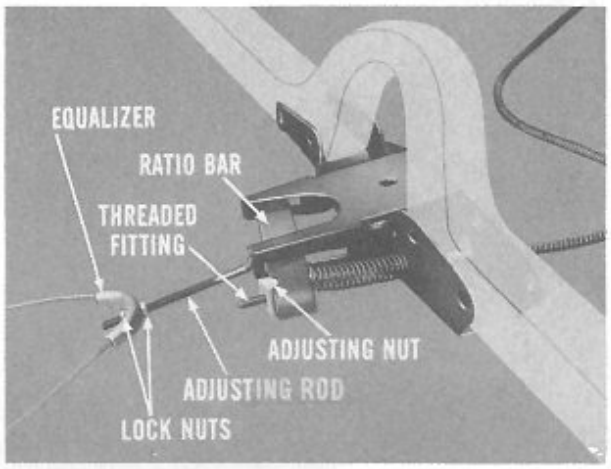


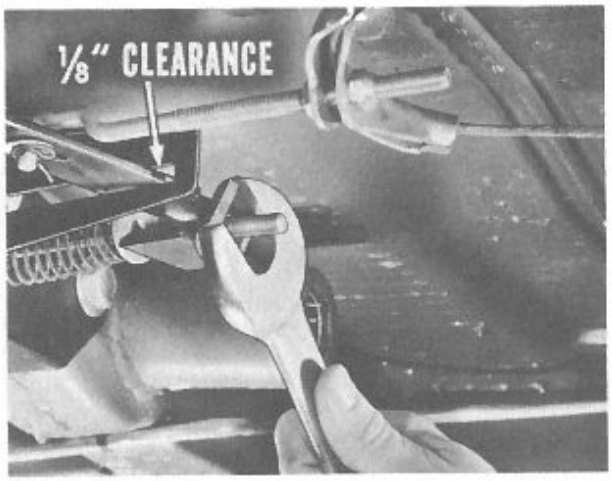
Don't forget to check the brake fluid level in the master cylinder. Clean the cover before you make your inspection so no dirt will enter the hydraulic system. Add the recommended brake fluid, if necessary, and you're done.

Parking Brake. The parking brake control lever assembly operates the rear brakes through a front cable assembly, ratio bar, an equalizer, and a rear cable assembly. The ratio bar is mounted on a bracket attached to the engine rear support crossmember.



The rear end of the front cable is attached to the ratio bar by a threaded fitting and an adjusting nut. The rear cable, which passes through the equalizer, is attached to the ratio bar by an adjusting rod and two lock nuts. The two ends of the rear cable are attached to the two rear wheel brakes. The cable is free to slide in the equalizer, which insures an equal pull at each rear wheel.



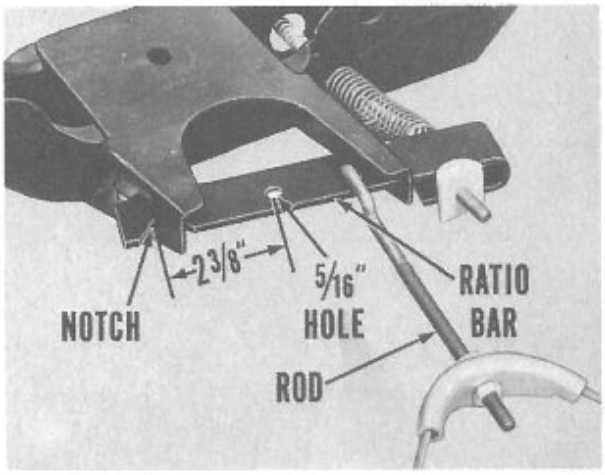


Parking Brake Adjustment. To make this adjustment, release the brake foot lever first. Second, make sure that the rear brake shoes are properly adjusted. Then adjust the front cable anchor nut until the ratio bar has ⅛" clearance at the rear end of the slot in the bracket.

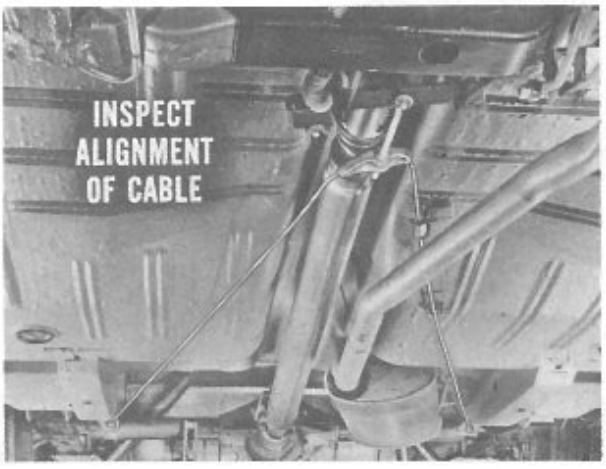
Next, tighten the lock nut on the rear of the equalizer until you can feel a slight drag as you rotate the rear wheels. Loosen the nut until the drag at the wheels is eliminated.

Finally, tighten the lock nut at the front of the equalizer. Pull the rear cable on one side, then on the other, to be sure it will slide freely through the equalizer. In addition, apply and release the pedal lever several times, and rotate the rear wheels as an extra check on brake drag.

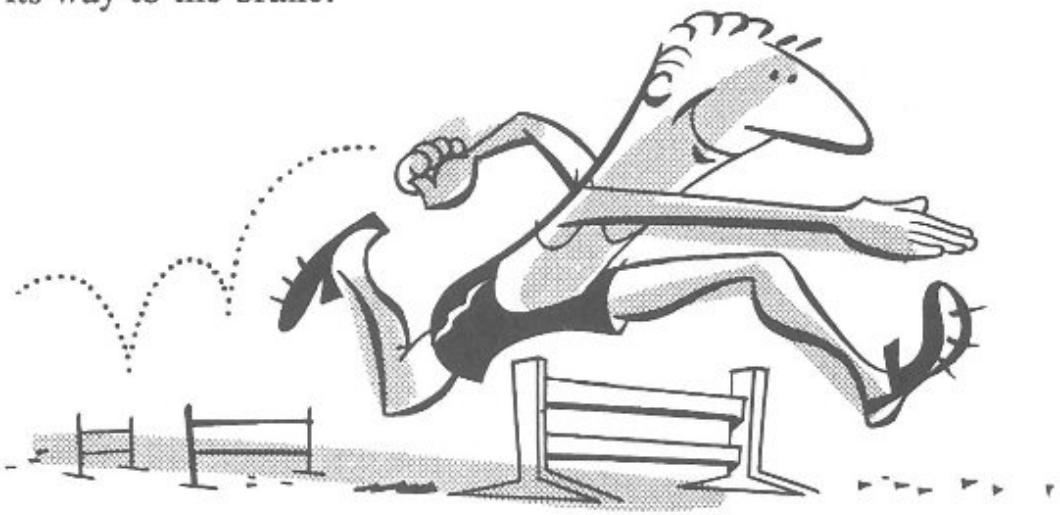
Parking Brake Hard Pedal. If a Valiant owner reports too much pedal effort required for applying the parking brake, you can correct this by changing the cable ratio. That's done by locating and drilling a new 5/16" hole exactly 2 3/8" from the center of the notch in the right end of the ratio bar. Remove the adjusting rod from its original location and install it in the new hole. Then, readjust the front and rear cables as outlined above.



Rear Brake Cable Alignment. Routing of the rear brake cable should be fairly straight through its brackets so it won't rub, bind, or hang up on any part of the underbody. On the right side, the cable goes directly back from the equalizer through a body side rail bracket, to the brake. But the left side is routed to avoid contact with the propeller shaft.

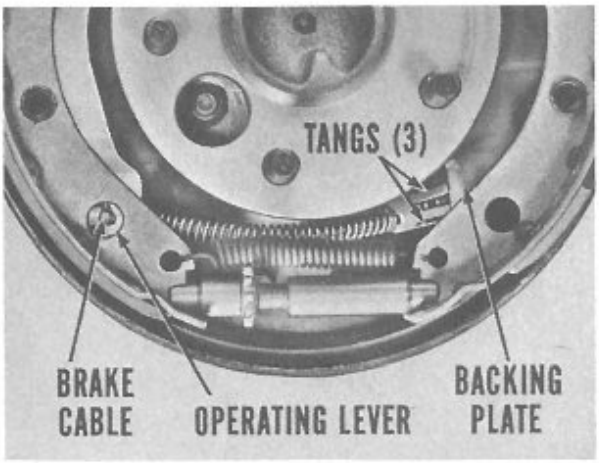


It goes through a forward bracket (Part No. 2082205), over a rear guide bracket (Part No. 2082605), and through a side rail bracket on its way to the brake.



If the left side of the cable does bind, or interfere at any point, you can pry off the forward and rear guide brackets. Use self-tapping screws or bolts and nuts to install new brackets to realign the brake cable. Also, make sure that the side rail bracket clips are properly secured on the bracket.

Rear Brake Cable Removal. If you have to remove the rear brake cable and housing assembly from the backing plate, here's how it's done. Disconnect the cable from the shoe operating lever. Press the cable housing end fitting tangs down tightly against the housing. Withdraw the housing and cable assembly through the hole in the backing plate.



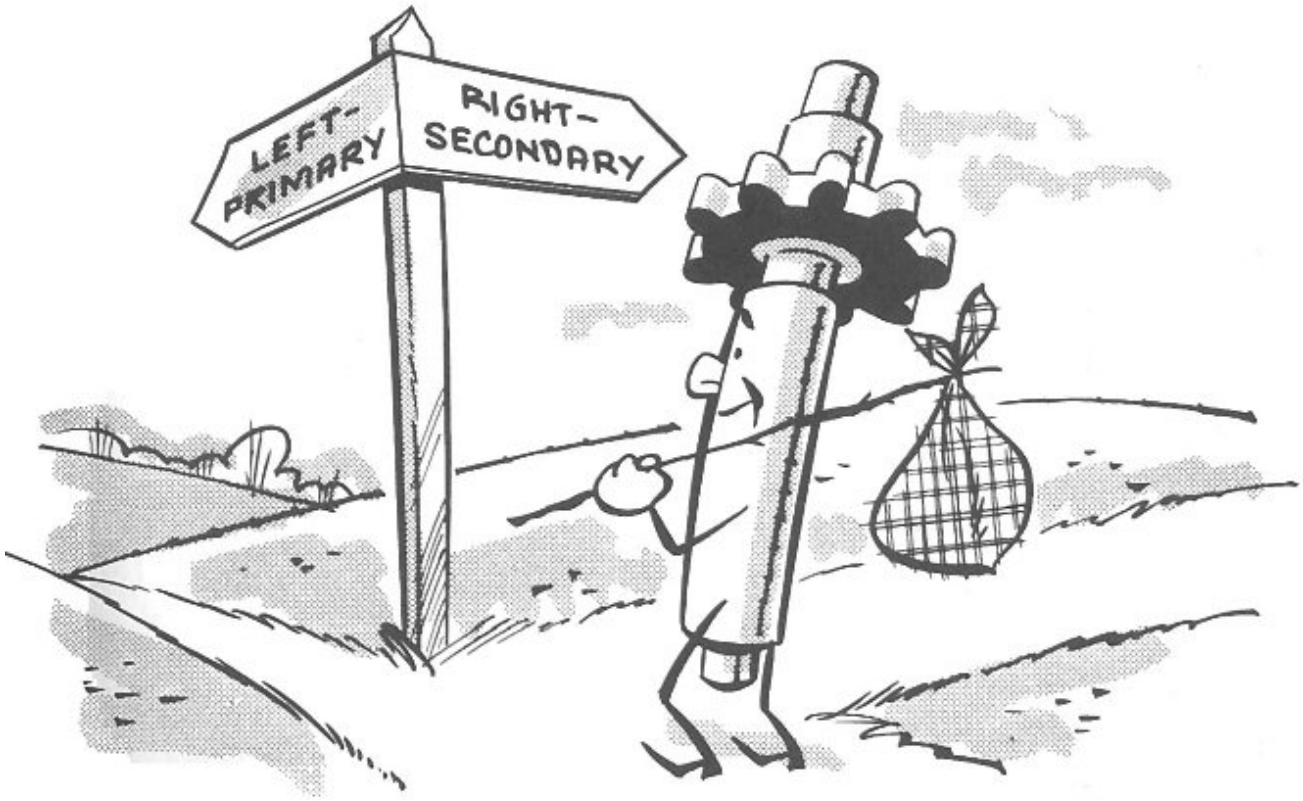
Clean the cable carefully and examine it for frayed strands. If the cable is damaged, replace it. Lubricate the cable with a light coat of MoPar Lubriplate. Reassemble the cable housing to the backing plate, and attach the cable to the operating lever.

Brake Shoe Removal and Installation. To remove a brake shoe hold-down spring, insert a blunt punch or a No. 2 crosshead screwdriver into the center of the spring. Hold the hold-down spring retainer clip, and press the hold-down spring in to disconnect it from the retainer.

When both shoes are removed, clean off the six platforms on the backing plate. Lubricate the platforms with a thin coating of MoPar Door Ease, or MoPar Lubriplate. Use a minimum amount of lubricant to avoid contaminating the lining.

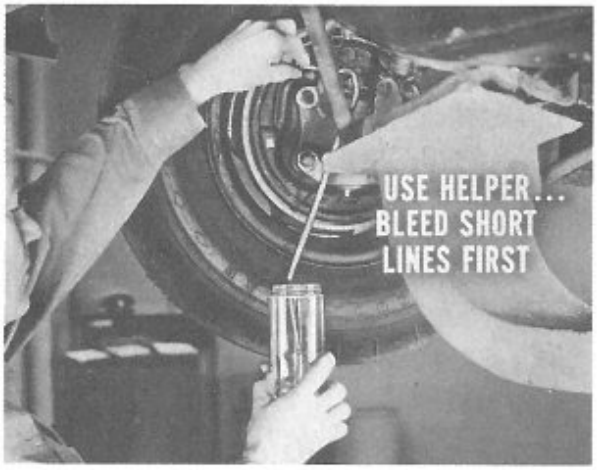
Make sure that shoes with linings of the correct length and width are installed at all locations. Then, install the primary shoe return spring on the anchor first. Next, install the secondary shoe return spring. This return spring installation sequence will insure proper alignment of both brake shoes.

Clean the star wheel carefully before you install it. Lubricate the adjuster threads lightly with Lubriplate. Locate the star wheel end toward the primary shoe on left wheels, and toward the secondary



shoe on the right wheels. Then hook up the star wheel spring. Use the blunt drift or crosshead screwdriver to reinstall the shoe hold-down springs.

Bleeding the Hydraulic System. If you use a helper to pump the brake pedal, bleed the short lines first: left and right front; then left and right rear. This cuts down the number of times the pedal has to be pumped. If you use the bleeder tank (C-3496), bleed the long lines first: left and right rear; and then, the short, front lines. There's apt to be more air in the long lines. Refill only with MoPar Hi-Temp brake fluid.



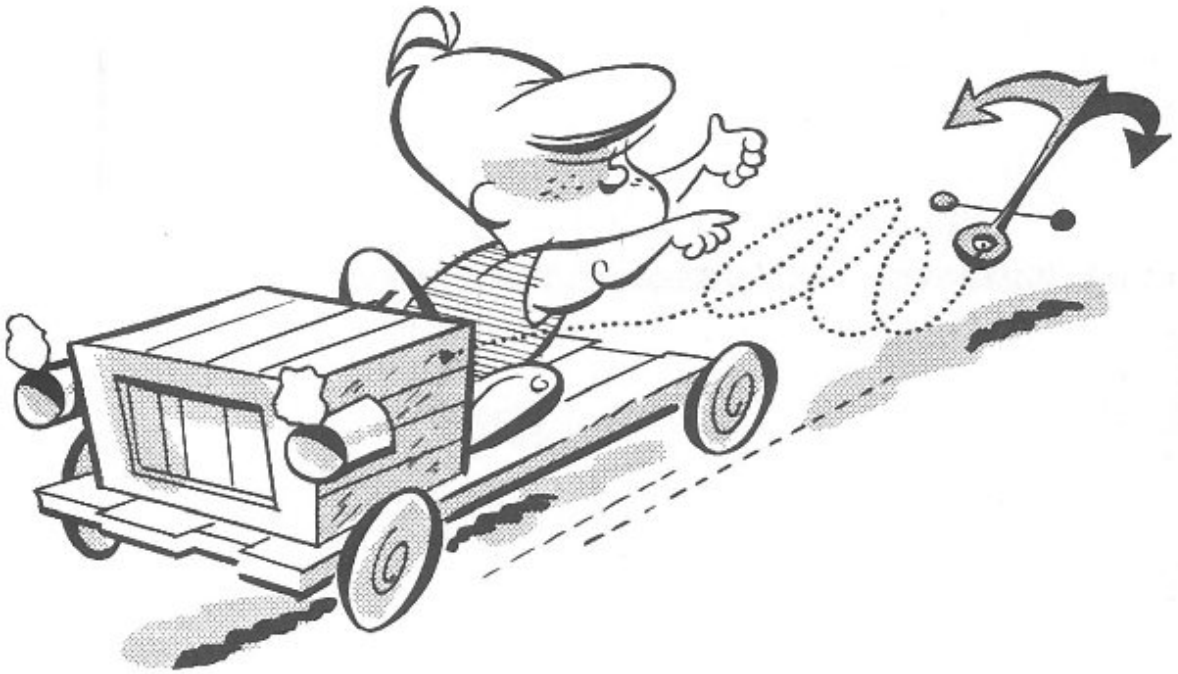
CAUTION: Use a box wrench to open and close the bleed screw. This is a small screw, and you'll find a box wrench will be easier to use than an open-end wrench.

VALIANT POWER BRAKES

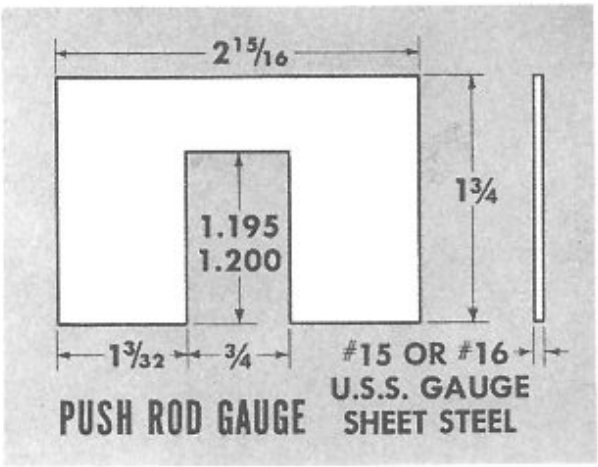
The power brake cylinder unit is mounted on the engine side of the dash panel and connected to the brake pedal through a power lever and pedal rod. The hydraulic brake master cylinder is mounted on the front face of the power cylinder.

Two external lines are used. One is a vacuum line connection to the intake manifold through a vacuum reservoir and vacuum check valve. The other is a hydraulic line connection into the brake system. Operation of the Valiant power brakes is similar to that used on types with which you're familiar.

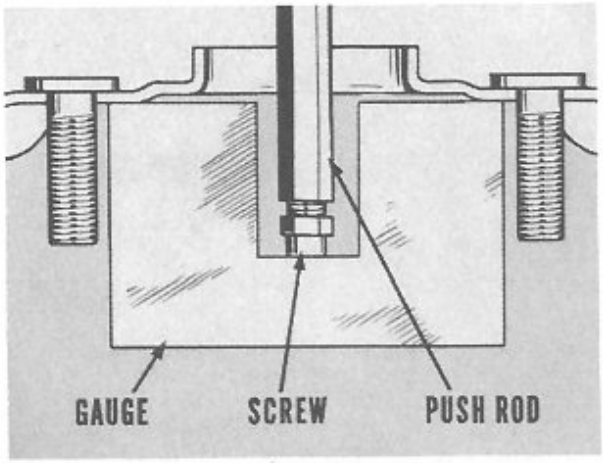
Power Brake Service. Only the hydraulic push rod requires adjustment, and that very rarely. It would be necessary if the push rod is transferred to another unit, or a new push rod is installed.



To make this adjustment, use a micrometer gauge or height gauge. You can make a gauge from a piece of #15- or #16-gauge sheet steel, 1¾″ wide and 2 15/16″ long. Exactly 1 3/32″ from one end, make a cut ¾″ wide, 1.195″ to 1.200″ deep.



Place the gauge cutout over the push rod so it rests against the face of the cylinder. You can then adjust the screw in or out to the specified dimension of 1.200″, as represented by the depth of the cutout.



SUMMARY

Suggestions in this reference book regarding Ram Induction engine tune-up, and recommendations on Valiant brake service are designed to help you provide the quality work to which your customers have been accustomed. Use them as your guide to maintain the confidence so many owners have in the ability of our Master Technicians.

CORRECTION NOTICE

Page 21 of the Service Reference Book for session no. 144 shows an incorrect part number for the Chrysler Corporation built distributor. The correct part number is 2095270. Please change this in your copy.

RECORD YOUR ANSWERS TO THESE QUESTIONS ON QUESTIONNAIRE NO. 147

If one carburetor is removed, a complete throttle linkage adjustment must be made when the job is reassembled.

RIGHT 1 WRONG

You can set timing on a ram induction engine with or without the distributor advance line disconnected, as vacuum has no effect at idle speed.

RIGHT 2 WRONG

Timing specifications for engines using the ram induction fuel system are 5° BTC for 361-cubic inch and 413-cubic inch engines, and 7½° BTC for the 383-cubic inch engine.

RIGHT 3 WRONG

Turning the bypass air bleed screw in produces a *richer* mixture, turning it out produces a *leaner* mixture.

RIGHT 4 WRONG

Each exhaust manifold of the ram induction fuel system has its own heat control valve.

RIGHT 5 WRONG

The accelerator pedal should be adjusted to give full throttle opening before the pedal touches the floor mat.

RIGHT 6 WRONG

When adjusting Valiant brakes, remove the forward adjusting hole covers from the left backing plates, and the rear adjusting hole covers from the right backing plates.

RIGHT 7 WRONG

The same width of lining is used for front and rear Valiant brakes.

RIGHT 8 WRONG

To adjust Valiant brakes, tighten the shoes until you can hardly turn the road wheel and then back off the adjustment 12 notches.

RIGHT 9 WRONG

If you use a helper to pump the Valiant brake pedal during hydraulic system bleeding, bleed the short lines first, then the long lines.

RIGHT 10 WRONG

LITHO IN U.S.A.