



WHAT MAKES A CAR SAFE?

There is a great deal of talk about safe driving. Many communities are now going through strenuous safety campaigns.

The first step in a campaign of this kind is to make cars safe to drive, and this is part of our job in the service department. We should educate the owner to the point where he is aware of what makes his car safe to drive, and to drive it only in this condition.

A safety inspection should include the following:

1. LICENSE PLATES

The plates should be clean and legible. They should not be obscured by bumpers, guards or other parts.

2. HORN

The horn should always be in good working order, and capable of being heard, under normal conditions, for not less than 200 feet.

3. REAR VISION MIRROR

The mirror should be clean and unblemished. Nothing should be attached or applied to the rear window which will hinder the view.

4. WINDSHIELD WIPERS

These must be in good working order, and where two wipers are used, both should operate. Wiper blades should be clean and free from rubber deterioration. The proper arc is seven inches.

5. BRAKES

Different states have different stopping requirements. In general, test stops should be made on dry, hard, level roads, free from loose material. Equalization of brakes is important, and most states require the final method of determining brake efficiency by actual road test. Brake lining should be inspected for thickness and grease saturation. All linkage should be checked. The usual specified stopping speed is indicated at a 20 mile period, and a full stop must be obtained within 30 feet. The emergency brake should be able to stop the car under the same conditions within 55 feet.

6. STEERING

Excessive steering wheel movement is placed at $2\frac{1}{4}$ inches at the outside circumference of the steering wheel. The following points should be examined:

- Upper steering column bushing.
- Up and down play of the steering column cross shaft.
- Proper fit of cross shafts and drop arms.
- Proper fit of steering king pins.
- Proper adjustment of all cross arms.
- Excessive wear and play in wheel bearings.
- Check for correct toe-in, caster, and camber limits.

7. LIGHTS

- Reflectors must be in proper condition.
- Bulbs should be checked for discoloration, sagged filaments and allowable candle power.
- Headlights should be in condition to operate in the parking, city and country driving positions.
- Lenses should be clean and not cracked.
- Lights should be properly focused to meet the requirements of local laws.
- Check the tail lights. Make sure a white light shows on the license plates, and a clear red light is visible to the rear. The specifications are that it be seen for a distance of 500 feet.

8. TIRES

When at least 50 per cent or more of the original tread is visible, tires are considered in "good" condition. When the tread is approaching smoothness, they are in "fair" condition, and when worn smooth are "unfit" to drive. Visible signs of tire weakness such as cuts, bulges, bumps and bruises are also classed as "unsafe." When a vehicle has two or more "unfit" tires it should not be passed as safe.

9. WINDSHIELDS

Replacement of windshields is required when they are cracked or discolored, thus interfering with the driver's vision. Such cracks or discolorations, extending a distance of three inches or more from bottom, top or sides, are considered unsafe.

REAR AXLE STANDARD GEAR RATIOS

(The ratio in the car when it left the factory)

Models	Ratio	Models	Ratio
126.....	4.66 to 1	136.....	4.08 to 1
133.....	4.66 to 1	143.....	4.08 to 1
226.....	4.66 to 1	236.....	4.67 to 1
233.....	4.66 to 1	243.....	4.67 to 1
326.....	4.66 to 1	336.....	4.38 to 1
333.....	4.66 to 1	343.....	4.38 to 1
426.....	4.67 to 1	443.. {	Open 4.08 to 1
433.....	4.67 to 1		Closed 4.38 to 1
526.....	4.38 to 1		
533.....	4.66 to 1	640.. {	Open 4.07 to 1
626.....	4.38 to 1		Closed 4.38 to 1
633.....	4.66 to 1		
		645.. {	Open 4.07 to 1
			Closed 4.38 to 1
726.....	4.38 to 1	740.....	4.38 to 1
733.....	4.38 to 1	745.....	4.38 to 1
734.. {	Open 3.31 to 1		
	Closed 4.07 to 1		
826.....	4.69 to 1	840.....	4.69 to 1
833.....	4.69 to 1	845.....	4.69 to 1
900.....	4.36 to 1	903.....	4.69 to 1
901.....	4.69 to 1	904.....	4.69 to 1
902.....	4.69 to 1		
		905.. {	Open 4.41 to 1
			Closed 4.69 to 1
		906.. {	Open 4.41 to 1
			Closed 4.69 to 1
1001.....	4.36 to 1	1003.....	4.41 to 1
1002.....	4.36 to 1	1004.....	4.41 to 1
		1005.....	4.41 to 1
		1006.....	4.69 to 1
1100.....	4.36 to 1	1103.....	4.41 to 1
1101.....	4.36 to 1	1104.....	4.41 to 1
1102.....	4.69 to 1	1105.....	4.41 to 1
		1107.....	4.41 to 1
		1108.....	4.69 to 1
1200.....	4.69 to 1	1203.....	4.41 to 1
1201.....	4.69 to 1	1204.....	4.41 to 1
1202.....	4.69 to 1	1205.....	4.41 to 1
		1207.....	4.41 to 1
		1208.....	4.41 to 1
1400.....	4.69 to 1	1403.....	4.41 to 1
1401.....	4.69 to 1	1404.....	4.41 to 1
1402.....	4.69 to 1	1405.....	4.41 to 1
		1407.....	4.41 to 1
		1408.....	4.41 to 1
		120.....	4.54 to 1
		120-B.....	4.09 to 1

ELECTRIC CLOCK FOR 120—120-B MODELS

Whenever it is necessary for distributors to return defective clocks to the factory they are to return the clocks only and not the compartment doors, as in many cases the doors are not in stock condition. It is just as easy to change the clock only, on an owner's car, as it is to change the clock and door.

PISTON SIZES—120-120-B

Pistons are being marked with the following letters stamped on the head:

AA—.0015 under standard
A—.001 under standard
B—.0005 under standard
C—standard
D—.0005 over standard
E—.001 over standard
H—.0015 over standard
K—.002 over standard
L—.0025 over standard
M—.003 over standard

The majority of production pistons varies from A to E in size, very few of the others being manufactured.

TIRE PRESSURES (CORRECTION)

The best riding results from current series cars will be obtained according to information received from the engineering department, from the following tire pressures:

	F	R
120 Sedan.....	23	25
Convertible.....	22	22
1400.....	33	33
Super.....	35	35
Twelve.....	38	38

LOW PRICES ON SPECIAL TOOLS

Special tool equipment always is a credit to any shop. Is yours in good condition? Check against this list. It represents surplus stock. Special prices have been assigned. Our loss is your gain. We wish to dispose of it to make way for new developments. First come, first served! Don't delay! Our supply is limited.

Tool No.	Name	Tool Catalog Page No.	Special Price
ST-853	Horn Button Wrench.....	32	\$.20 each
ST-615	Piston Reamer, $\frac{3}{4}$ " (Old Style).....	13	3.00 each
ST-617	Piston Reamer, $\frac{7}{8}$ " (Old Style).....	13	3.00 each
ST-614	Piston Pin Bushing Reamer, $\frac{3}{4}$ " (Old Style).....	13	3.00 each
ST-715	Piston Reamer, $\frac{3}{4}$ " (Old Style).....	13	3.00 each
ST-692	Copper Hammer ($\frac{1}{2}$ lb. size).....		.25 each

SURELY THE LADY IS NOT REFERRING TO YOUR SHOP?

"Regards to your slogan 'Ask The Man Who Owns One' why not add 'And The Woman Who Drives' or something to that effect. In my opinion more attention should be given to service stations. For six years that I have owned Packards it was necessary to return many times the second and third time to have the job done right and believe many others besides myself would use your service stations in preference to small shops if you could improve them."

Mrs. G. M. W., Jr.

THE USE OF SCIENTIFIC EQUIPMENT AND DATA IN DIAGNOSING SERVICE COMPLAINTS

When a car owner drives into the service station, naturally the most important thing is to find out the reason he came in. When asked, however, as to the nature of his trouble he usually replies, "I don't know—that's why I came in." At this point the service man will probably explain, that he did not expect the customer to tell him the nature of his troubles, but the service man will try to draw from the customer, during a minute's conversation, the things which will shed some light as to the seat of the trouble.

For example—if the customer states that the lights of his car dim, when the car hits a bump, it should indicate to the service man, that there is a loose connection or a grounded cable, somewhere between the ammeter and the lights. But if the lights flash when the car hits a bump, it indicates a loose connection, somewhere between the generator, ammeter, and battery.

Should the customer state, that when he presses on the starter button or closes the starter switch, nothing happens, it indicates trouble in the battery or starting motor circuit. If when he presses the starter button the engine turns over, but does not take hold, it indicates that the battery and starting motor circuit are functioning, but the trouble is in the ignition or fuel supply system.

The foregoing examples are used merely as illustrations. In any event, after the customer gives his reason for coming in, it is always well to ask if any work has lately been done on the car. Thus, if he states that he is having trouble with his lights, and informs the service man that he recently had the radiator repaired, it indicates disarranged or damaged wiring or connections possibly made by the mechanics in doing the radiator work.

It takes but a few minutes to get this sort of information, but it impresses a customer that the service man is going about the job in a business-like manner. At this point, the service man is in position to suggest an over-all check-up of the motor, and it is an easy matter to take the car to a motor analyzer or motor tuner, and connect it to the voltmeter, ammeter, spark gap, and vacuum gauge, and make these tests.

If now the ignition switch is turned on, the voltmeter should show not more than .2 of a volt, with the distributor breaker points closed and the ignition coil drawing normal current, which will be approximately 3 amps. If a greater voltage drop is noted, it means loose connections in the ignition circuit between the distributor and the battery.

The next operation in the over-all motor check-up is to turn off the ignition and close the starting motor circuit. If the battery cables and starting motor are in good condition, the normal starting motor draw will be approximately 300 amps., and the voltmeter will drop back to 3 or 4 volts, and immediately come up to 5 or $5\frac{1}{2}$ volts after the starting motor has brought the engine to cranking speeds. The bigger the swing of the voltmeter hand, the better the starting motor and battery circuit.

If the voltmeter hand drops back to $4\frac{1}{2}$ or 5 volts only, and slowly comes back to $5\frac{1}{2}$ volts, it indicates a low battery, corroded terminals, defective starting switch, dirty commutator or starting motor. The better the condition in the starting motor circuit, the more current it will draw in starting, and the less it will draw for cranking the engine after it is up to speed.

If the foregoing starting indications are correct the ignition switch should be turned on, and the engine started. The first check should be for engine vacuum, because the vacuum gauge is now acting as a very sensitive tachometer. Any variation in engine speed is indicated by variations in the vacuum gauge reading. If the engine is warm, it should run evenly, and the vacuum meter hand should stand steady. If the hand rises and falls, due to a rolling engine, a slight adjustment of the carburetor should be made until the hand is steady. It might be well to point out here, that in making the over-all check-up the throttle should be slightly cracked. (If a carburetor analyzer is attached to the tail pipe, a check-up can be made at this point, along with the vacuum test.)

A jerky action of the vacuum gauge hand indicates sticky valves. A low and uneven reading of the vacuum gauge indicates low and uneven compression which might be due to piston ring condition, gaskets, weak valve springs, carburetion or faulty ignition. If the vacuum is high and the needle stands still, it indicates high compression and that the valves and rings are in good condition.

Next the spark is checked by opening the spark gap to approximately 5 mm. If the ammeter is steady and does not fluctuate, but there is an occasional miss in the spark gap, it indicates trouble in the ignition coil or condenser. If the ammeter fluctuates, it indicates trouble in the distributor breaker points.

In order to check the generator, bring the engine down to a slow idle below the cut-in speed of the generator. The voltmeter will show 6 volts, and as the engine speed is gradually brought up, the voltage will rise to around 7 volts when the cut-out closes, and if the engine speed is increased, the voltage will increase to $7\frac{1}{2}$ to 8 volts. If the battery is fully charged it may go a little higher. If there are loose connections or bad points in a generator cut-out or the regulation is faulty the voltage may go as high as 9 or 10 volts. If the generator is not functioning properly, the voltage may not go higher than $6\frac{1}{2}$ volts.

This over-all check-up should not require more than 5 to 10 minutes, and the service man by this time will have a clear and informative picture of the over-all conditions of the engine. Then, if trouble is indicated in the battery circuit for example, he is in a position to sell the customer the necessary service work in connection with taking out the floor boards, replacing battery cables, renewing battery, or repairing the starting motor. If engine troubles are indicated, he is in a position to tell and sell the customer on an engine job, on which a complete analysis will be necessary to determine just how much work is required to put the engine in first class operating condition.

The particular point to be stressed here is that by making an over-all check-up it is an excellent way of selling the customer on the service man's ability to properly diagnose engine troubles.

(Part of talk given by H. C. Taylor at Service Meeting)

WHY RESISTORS ON RADIOS?

By Lester Beltz, Electrical and Radio Engineer

Occasionally we receive inquiries from the field relative to the necessity of using spark plug resistors with our radios. In order that you may have a thorough understanding of this subject, our radio engineer has supplied the following information:

In general, ignition interference in an automobile radio can be divided into two sources—first, interference fed into the receiver through the battery circuit, and, second, interference intercepted by the antenna and fed into the receiver through the antenna circuit. Packard radios are equipped with internal filters to eliminate the troublesome ignition interference normally carried into the receiver through the battery circuit. In other words, with the antenna disconnected no ignition interference should be present.

It has been found impractical to filter out the troublesome interference intercepted by the antenna because this energy varies so widely in frequency. Two means remain to prevent this energy from reaching the receiver—one is to ground or shield controls, pipes or speedometer cable so that this radiated interference is not transferred into the driver's compartment whence it reaches the antenna through the dome lamp cable or by direct interception by the antenna, and the other is to eliminate the interference at its source by using the conventional ignition interference suppressors.

The use of resistors on the spark plug cables makes the radio installation a simple task as well as a permanent spark elimination job. If carefully installed, Packard radios do not require the use of resistors at the spark plugs. An installation of this kind, however,

requires a trained man and considerably more installation time. It has been found on so-called "resistorless" installations that as soon as the ignition cables and spark plugs have been in service a while, or the lighting cables have become slightly out of place, the objectionable spark interference tends to return, thus requiring attention. It is frequently necessary, in such cases, to do the spark elimination all over again at the end of 10,000 miles of car service.

With the present low value of resistance used in the spark plug resistors no effect on the car performance can be measured.

All Packard car performance, endurance tests, cold room tests and power ratings are based on the use of resistors, and it has been proven conclusively that resistors have no ill effect on car performance.

Constant research work is in progress to reduce the electrostatic capacity of the Packard ignition system to a minimum, both from a standpoint of ignition performance and minimizing the objectionable spark radiation.

Competitive radios have been placed on the market during the past year which claim to require no resistors. It will be found, upon checking up these sets, that they are either lacking in sensitivity or require considerable labor and maintenance to keep the spark interference at a commercial minimum.

It is not only our aim to send the radio installation out to the customer free from spark interference, but to make it stay free, thereby giving many enjoyable miles without constant service and attention.

SPEEDOMETER PINIONS AND BEARINGS

Rear Axle Gear and Pinion	Ratio	No. of Teeth	Models	Speedo. Pinion	No. of Teeth	Speedo. Gear	No. of Teeth	Speedo. Pin. Brg.
202370	4.69-1	61-63	1001-2, 1100-1-2 1200-1-2, 1400-1-2	137102	24	118024	8	158145
202368	4.07-1	61-15	1001-2, 1100-1-2	148440	21	118024	8	158147
202369	4.36-1	61-14	1001-2, 1100-1-2, 1200-1-2, 1400-1-2	175442	23	118024	8	175441
202705	5.08-1	61-12	1200-1-2, 1400-1-2	184571	25	118024	8	184497
141903	4.41-1	75-17	1003-4, 1103-4-5 1203-4-5, 1403-4-5	175442	23	118024	8	175441
141459	4.06-1	69-17	1003-4-5-6, 1103-4-5, 1203-4-5, 1403-4-5, 1005-6, 1107-8, 1207-8, 1407-8	148440	21	118024	8	158147
141460	4.69-1	75-16	1003-4-5-6, 1103-4-5, 1203-4-5, 1403-4-5, 1005-6, 1107-8, 1207-8, 1407-8	137102	24	118024	8	158145
184410	5.07-1	71-14	1003-4-5-6, 1103-4-5 1005-6, 1107-8, 1207-8, 1407-8	184571	25	118024	8	184497
141903	4.41-1	75-17	1005-6, 1107-8, 1207-8, 1407-8	118970	22	118024	8	158146
303396	4.36-1	48-11	120	303489	18	303487	6	300536
303547	4.09-1	45-11	120-B	303604	17	303602	6	300536
303766	4.54-1	50-11	120, 120-B, 120-BA	303804	25	303802	8	300536
303546	4.7-1	47-10	120-A	303495	16	303493	5	300536