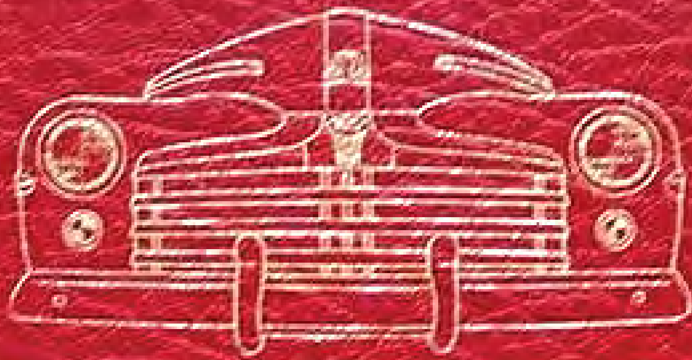
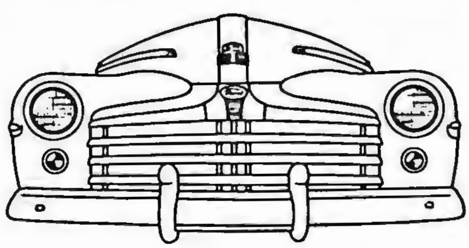


FORD V·8
SERVICE BULLETINS

1941-1948 Complete

FORD V-8
SERVICE BULLETINS



1941-1948 Complete

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A reference guide for the enthusiast —
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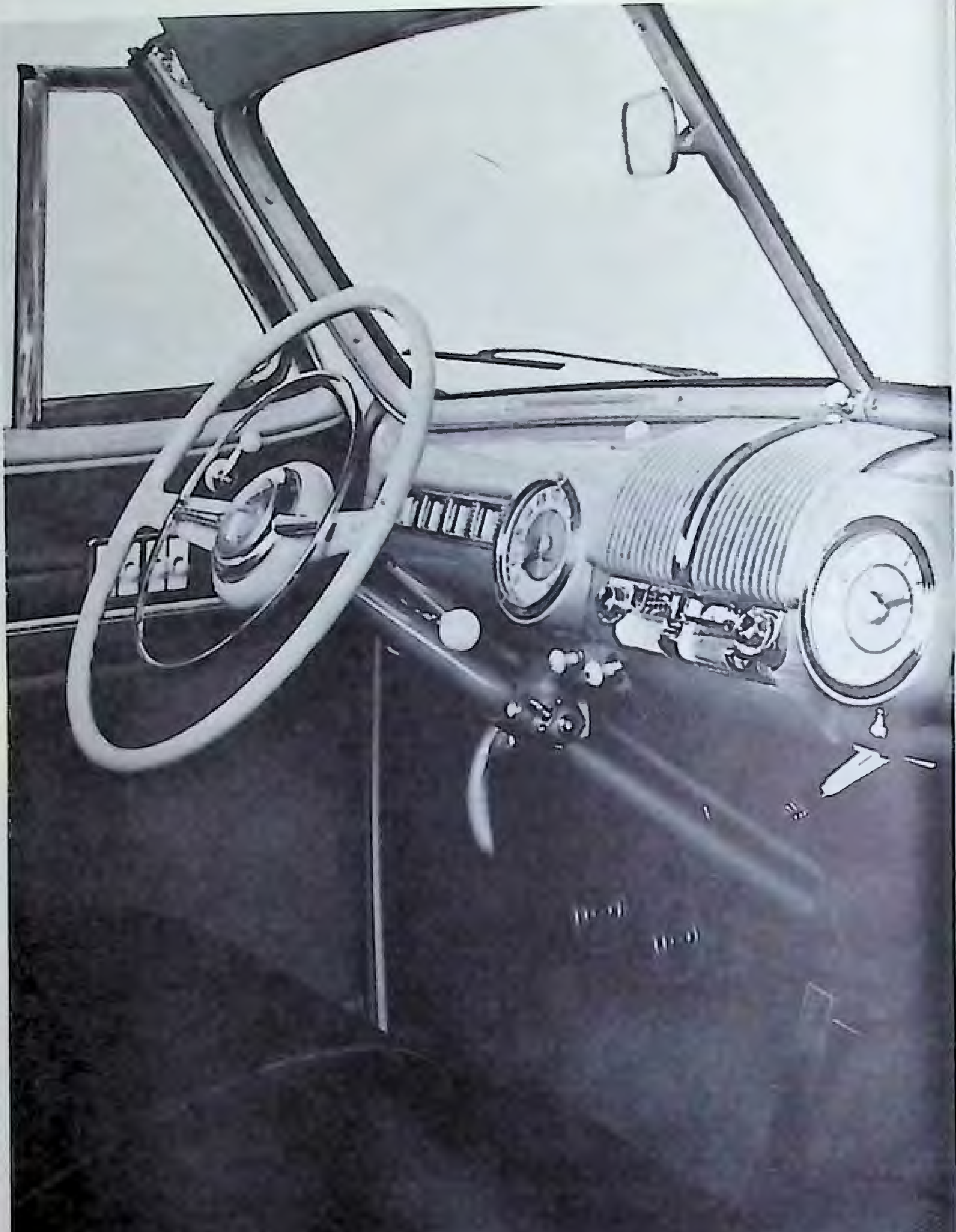
LOCKPORT, NY 14095



Passenger's view of the 1947 Ford Sportsman Convertible. Fewer than four thousand of these specially hand-constructed models were built and distributed during the immediate postwar years.

FORD V-8
SERVICE BULLETINS

1941-1948 Complete

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Special Note: **Those features in 1941-1948 models which were continued unchanged from 1940 and earlier production were not necessarily subject to fresh attention in the course of the 1941-1948 Bulletin time frame. Delineation of these constants may be located in the chronologically preceding volume, designated for the 1938-1940 cars.**

FOREWORD

In the same season that Henry Ford managed to buy out the last of his stockholders, the Ford Motor Company began the issue of Service Bulletins as an informative pipeline from the factory to its agents. The year was 1919; the Model T was in full flower.

From this beginning the distribution of cumulative Service Bulletins went on to become an institution at Ford. A decade later these factory letters would elaborate on the all-new Model A. A few years later they would begin to log changes during that rapidly refining era of the vintage V-8 cars.

Today the serious restorer looks to the older Bulletins not only for service guidance, but to glean running changes in specifications of parts and equipment which resulted from a practice then common at Ford. As with all car manufacturers, the company did not create every part of its automobile intracompany – though Ford was more integrated than any other firm. Many of its parts and subassemblies were purchased from a vast field of outside vendors. By reason of varying manufacturing procedures, improved methods, and occasionally for convenience, within the specs, some parts would be produced in slightly different detail.

Engineering and design changes would also be reflected in new supplies that were intended to supercede the existing parts. The long-standing factory practice of consuming each part run in assembly, down to the last run-out unit, caused changes to occur in a somewhat unprogrammed stream over the whole production period of a given series.

These 1941-1948 Bulletins lock up the final Ford chassis built with transverse spring suspension and other mechanical details which had become standard among Ford products some thirty years earlier. A single body design series, which was introduced in the fall of 1940, was used commonly throughout this closing production span.

While the product profile remained constant during this period the years were marked by grave changes within the top echelons of Ford management. Edsel Ford, son of the founder, and long the nominal president of the company, died in 1943, at the comparatively youthful age of 49. Besides his wife he left three sons and a daughter as fledgling heirs apparent. After first stepping into his son's place as chief executive officer, the aging Henry

Ford then began to withdraw gradually from his active role. With the elder Ford's passing, in 1947, a period of vast overhaul within the company began. Preparations were started in earnest for an all-new Ford chassis. This departure product would later bow as the 1949 model.

In the Spring of 1942, all automobile manufacturing ceased in the U.S. for the duration of World War II. Though no new models were to be produced for the next three years, Service Bulletins were issued periodically with emphasis on various extra data to assist in the maintenance of existing models.

It was during this time also, that a series of comprehensive special Bulletins, devoted exclusively to Trouble Shooting, came to be issued. Each issue was devoted to a major component of the car and appeared on yellow paper which was calculated to set it off for quick reference.

These supplementary Trouble Shooting Bulletins are also included in this volume. While no longer distinguished by contrasting paper stock, each may be readily located by its common position at the end of the subject section.

Ford became the first manufacturer in the country to resume production after war's end, early in August, 1945. The content of future Bulletins then returned to a primary emphasis on new product.

In determining the Bulletins pertinent to the 1941-1948 models, several later 1948 dates were included which additionally make reference to the all-new 1949 car. This tabular material provides the inveterate Fordist with handy contrasting specifications, as a matter of interest.

Apparent gaps in Bulletin numbering can be accounted for by the fact that many assigned subject areas were never actually to be used in practice, while others were undersubscribed, and still others were created beyond the frame of the original subject outline, simply by adding zeros as required.

For intense focus on various other vintage Ford products, additional complete Service Bulletin collections have also been published by Post-Era in similar permanent book form. These cover MODEL T (1919-1927); MODEL A (1928-1931); the EARLY V-8 (1932-1937); the IMPROVED V-8 (1938-1940).

— THE PUBLISHER

CONTENTS

Foreword

These Service Bulletins have been planned so that eventually they will contain complete service information not only as to actual repairs but will likewise contain helpful suggestions on how to organize, equip, and supervise an efficient and profitable service department.

The initial Bulletins under this system bear the date April 15, 1938 and represent chiefly a revision of the material already published in the previous type of Service Bulletins. This material has all been brought up-to-date and considerable new material added. All of this material should be read completely by each interested person in your service organization.

The success of this plan will depend on each new bulletin being inserted in its proper place in the binder. Complete instructions for the use and the filing of new bulletins are explained on the following pages.

SERVICE

*In the Ford Motor Company we emphasize service equally with sales * It has always been our belief that a sale does not complete the transaction between us and the buyer but establishes a new obligation on us to see that his car gives him service * We are as much interested in his economical operation of the car as he is in our economical manufacture of it * This is only good business on our part * If our car gives service, sales will take care of themselves * For that reason we have installed a system of controlled service to take care of all Ford car needs in an economical and improved manner * We wish all users of Ford cars to know what they are entitled to in this respect so that they may readily avail themselves of this service.*

Henry Ford

HOW TO FIND THE INFORMATION YOU NEED

Bulletins About a Particular Part or Assembly

Subject Numbers

All Service Bulletins are filed according to the Subject number in the upper outside corner.

Page Numbers

Each Service Bulletin carries a page number in addition to the Subject number mentioned above. When there is more than one sheet of the same subject number the sheets are filed according to page number also.

Page numbers are purposely skipped so as to permit the printing of additional information on a given subject if later required.

Bulletin Headings

Several types of headings are used to indicate which types of units the particular sheet applies to.

SERVICE Ford BULLETIN

This heading indicates sheet applies to Ford units only.

MERCURY SERVICE BULLETIN Ford

This type heading indicates that sheet applies to both Ford and Mercury.

Lincoln Zephyr SERVICE Ford BULLETIN MERCURY

This type heading indicates that sheet applies to Ford, Mercury and Lincoln-Zephyr.

SERVICE BULLETIN

This type heading indicates that sheet applies to Ford, Mercury, Lincoln-Zephyr and Lincoln.

Several other combinations also are used depending on which unit or combination of units are covered on the particular sheet.

Model Indication

ABOVE APPLIES TO MODELS:

STARTING 1938

In addition to the heading of each sheet indicating to which units the particular service bulletin applies, the model or models to which the bulletin applies is indicated in the lower outside corner.

Part Numbers

The basic part number of various parts or assemblies is used in establishing the subject number for the bulletin sheet covering that part or assembly.

Service information dealing with a particular part will be found either under the subject number agreeing with the basic part number of the part or the part or assembly with which it is used.

ABOVE APPLIES TO MODELS:

ALL

Bulletins About Services Involving Several Part Number Groups

Some service information can not be identified by any one basic part number. An example of this would be "engine tune-up" instruction which has to do with the valves, pistons, battery, carburetor, distributor and many other parts or assemblies.

There are many such operations and for this reason seven additional sections are included in this book as follows:

SERVICE MANAGEMENT

Subjects 1 to 999 will contain foreword, etc., and deal with the establishment of various departments within the service department and will contain suggestions of particular interest to Dealers, Service managers, shop foremen and Service floormen.

APPEARANCE SERVICES

Since these services include everything affecting or contributing to the appearance of the car and actually embraces the entire car from an appearance standpoint, these services are assigned subject numbers all preceded by the letter "A" (a for appearance).

CONTROL

The control of cars or trucks likewise involves several part number groups and is considered as a separate subject.

By control, everything affecting the control is meant. To control a car or truck the driver must be able to: **direct it** where he wants to, **stop** it when he wants to and to **see** where he is going.

This subject should not be confused with "performance" which is a separate subject group (see below).

All subjects in the control section are preceded by the letter "C."

EQUIPMENT

The equipment section provides a place for Suppliers Bulletins which include description, maintenance and repairs of equipment as well as equipment lists. On the bottom of most pages throughout this book the equipment required for the particular operation is listed.

EQUIPMENT USED:

HEYER—EGDAF—STROBOSCOPE ADAPTER
HEYER—HI—FORD LABORATORY TEST SET
HEYER—HI—DFZ DISTRIBUTOR STROBOSCOPE

MAINTENANCE SERVICES

In this section maintenance services including lubrication, washing, tightening services, inspections, etc. are included and each subject number is preceded by the letter "M."

PERFORMANCE SERVICES

In this section each subject number is preceded by the letter "P" and includes all services having to do with performance such as engine tune-up, etc.

SPECIFICATIONS

Subject numbers in this section are preceded by the letter "S" and will include means of identifying each model. This section will also contain engine performance curves and similar infrequently used data.

ABOVE APPLIES TO MODELS:

ALL

July 1, 1941

Printed in U.S.A.

How to Check Your Bulletins

The success of the whole bulletin plan depends on new issues being properly filed in your binder and obsolete sheets being removed.

The list of bulletins given below provides a method for Ford and Lincoln-Mercury dealers to check the completeness of their bulletin binder and, a means of ordering replacement sheets.

Before you insert this page in your bulletin binder, starting in the front of the binder, compare your arrangement with the arrangement given here.

Note the subject number, page number, and date, as well as arrangement.

Remove from your binder any sheets not listed below bearing a date prior to December 7, 1947.

Order sheets that are missing. Place an X on this sheet in front of the bulletins that are missing, soiled or torn in your bulletin binder. Forward this sheet to your Ford Motor Company District Office and this will serve as an order for those bulletins (this sheet will be returned to you). No letter is required.

This list is complete as of December 7, 1947 and, as new sheets are sent out, they should be added according to filing instructions in the left-hand margin of each.

This page will be revised periodically.

LIST OF BULLETINS

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1	1	
2	1	Feb. 28, 1948
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999	13	June 7, 1947
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1105	1	Apr. 15, 1938*
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1115	1	Apr. 15, 1938*
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1506	11	Nov. 18, 1938*
1506	19	July 31, 1940*
1506	21	July 31, 1940*
1506	23	July 31, 1940*
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2005	11	July 27, 1947
2005	13	July 27, 1947
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2062	3	Nov. 18, 1938
2140	3	Nov. 18, 1938
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3000	1	May 17, 1947
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3000	21	July 17, 1947
3000	23	July 17, 1947
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3010	53	Oct. 6, 1939*
3010	55	Oct. 6, 1939*
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3503	73	Apr. 15, 1938*
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3503	87	Apr. 15, 1938*
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6999	17	May 25, 1945
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7124	11	Oct. 6, 1939
7124	15	Oct. 6, 1939
7204	7	Oct. 6, 1939*
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7650	15	June 6, 1941*
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7999	105	June 17, 1947
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8005	15	May 1, 1944*
8005	21	May 1, 1944*
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8501	1	July 1, 1941*
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9510	19	Feb. 28, 1948
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9510	47	Nov. 25, 1938

*Will not be reprinted when present supply is exhausted.

CARS TRUCKS BUSSES

DEALERS' SERVICE BULLETIN

FORD MERCURY LINCOLN

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9510	51	Apr. 15, 1938
9510	57	Apr. 15, 1938
9510	59	Apr. 15, 1938
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9510	73	Nov. 25, 1940*
9510	75	Nov. 25, 1940*
9510	77	Nov. 25, 1940*
9510	79	Nov. 25, 1940*
9510	81	Nov. 25, 1940*
9510	91	Nov. 25, 1940
9510	93	Nov. 25, 1940
9510	95	Nov. 25, 1940
9510	97	Nov. 25, 1940
9510	99	Nov. 25, 1940
9510	101	Nov. 25, 1940
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10883	3	Nov. 25, 1938
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11999	13	May 25, 1945
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12000	51	May 20, 1941
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12000	85	May 1, 1941
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12000	111	Apr. 16, 1941*
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15999	49	Nov. 25, 1938
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15999	53	Apr. 15, 1938
15999	55	Apr. 15, 1938
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18080	11	Sept. 9, 1939*
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C-30-WA	17	Apr. 15, 1938
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C-30-WA	41	Apr. 15, 1938

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S-2000	1	Oct. 6, 1939*
S-4000	1	Dec. 29, 1939*
S-5000	1	Dec. 29, 1939*
S-6000	19	Feb. 15, 1939
S-6000	33	May 1, 1944
S-6000	35	Feb. 15, 1939
S-6000	37	Feb. 15, 1939
S-6000	39	Feb. 15, 1939
S-6000	57	May 1, 1944
S-6000	59	Feb. 15, 1939
S-6000	75	May 1, 1944
S-6000	77	Oct. 6, 1939
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S-6000	119	May 20, 1941
S-6000	137	May 1, 1944
S-6000	139	Apr. 1, 1941
S-10000	1	Dec. 29, 1939*
S-13000	1	Oct. 6, 1939*

To FORD MOTOR COMPANY DISTRICT OFFICE: My Service Bulletin binder requires the sheets marked with an "X" above. These should be sent to ____________________

I understand that this sheet will be returned to me along with the above sheets.

February 28, 1948

Shop Safety

Safety in the shop pays dividends. Time lost due to accidents cannot be made up. Shop personnel and equipment should be provided with the latest safety devices. Institute a program of safety training, and follow it up by the frequent display of timely and pertinent safety posters and bulletins. Safety should be discussed whenever shop personnel are meeting for any other purpose. Meetings should also be called expressly for the purpose of discussing safety. In this way, personnel will become more conscious of safe practices in shop procedures. Below are listed some general shop rules that will aid in promoting shop safety. However, it must be remembered that the availability of safety devices will not promote safety in the shop unless the personnel are trained in their application and made conscious of them.

a. Battery.

(1) *PRESENCE OF HYDROGEN GAS.* Hydrogen gas is produced in the course of the battery's normal operation in the car. Flames or sparks might cause this gas to explode if brought near the vent openings of the battery. Closed rooms where batteries are being charged, also, present a hazard of fire or explosion as the hydrogen gas is given off in much larger quantities during the charging process. See paragraph d (10).

(2) *LIQUID IN BATTERY.* The liquid in the battery is a solution of sulphuric acid. If this acid is accidentally spilled on the skin or spattered in the eyes, it should be flushed away promptly with clear water. Seek medical aid if discomfort continues. If acid is spilled on the clothes, wet them thoroughly with a weak solution of ammonia or with sodium bicarbonate (baking soda) dissolved in water.

(3) *MIXING ELECTROLYTE.* Electrolyte solution should be prepared by diluting sulphuric acid with water. Always add the acid to the water, adding slowly and stirring constantly until all of the acid has been added to the water. Never add water to the acid.

(4) *BATTERY GROUND STRAP.* Always remove the battery ground strap from the battery before working around the fan, the front of the engine, or inside the engine after the engine oil pan has been removed. This precaution will eliminate the possibility of someone else inadvertently cranking the engine.

b. Welding.

(1) *OIL AND GREASE.* Do not use oil or grease on cylinder caps, regulators, or valves, or wear greasy gloves. Do not store tanks where grease or oil will drop on them. An explosion might occur if these rules are violated.

(2) *VALVES.* Close valves on both tanks when leaving the equipment or if the hose should catch on fire.

(3) *DIAPHRAGMS.* Always make sure that the pressure is released from both diaphragms after shutting off tank valves.

(4) *TORCH.* Close the oxygen valve first when either shutting off the torch or in case the torch backfires. Backfires are commonly caused by:

(a) Allowing the tip to get too hot.

(b) Holding the tip too close to the job.

(c) Insufficient pressure of acetylene when lighting torch.

(d) Not opening valves and letting air and gas flow through the lines for a few seconds before lighting or after changing either of the tanks.

(5) *FIRE.* Use wet sand or dry lime to extinguish an acetylene fire. Do not use a fire extinguisher, as the fire will be spread by its use. A fire extinguisher, however, should be readily available to the operator for use with other fires. Never weld around inflammable material such as paint, oil, coal, etc.

(6) *SHIELDS AND GOGGLES.* When arc welding, use an approved shield with an arc welding glass lens for the protection of the operator's eyes. An additional shield should be placed around the arc to protect the eyes of others. Standard welding lens should be used in goggles for acetylene welders.

c. Cleaning Tanks and Solutions.

(1) *WARNINGS.* Caustic tanks should have a large sign marked "Danger—Caustic" placed over them. Acid crocks should have a large sign marked "Danger—Acid" placed over them.

(2) *BORIC ACID.* Boric acid should be readily available and in plain view, in a one-gallon bottle. Boric acid should always be kept near any caustics or acids to act as a neutralizing agent in case caustics or acids are spilled in the eyes, on the body, or on the clothes.

(3) *HANDLING PRECAUTIONS.*

(a) *Protective Clothing.* When handling acids, or caustics, employees should wear rubber gloves, rubber acid-proof goggles, and a rubber apron.

(b) *Filling Containers.* When filling containers, extreme care must be used.

(c) *Disposing of Caustics and Acids.* When disposing of caustics and acids after use, they should be diluted with water as much as practicable.

(d) *Mixing or Diluting Caustics and Acids.* When mixing or diluting caustics and acids, slowly add the caustic or acid to the water, stirring constantly. Never add water to the acid or caustic.

d. Miscellaneous.

(1) *PAINT SPRAY BOOTHS AND EQUIPMENT.* Paint spray booths should be kept clean and free of paint-saturated rags or paper. They should be well protected from fire hazards, and there should be an ample supply of fire extinguishers readily available. See subparagraph (10). Vapor-proof lights should be used in paint booths. Portable lights should be also vapor proof. Ample ventilation should be provided to insure that employees will not be overcome by paint-remover fumes and to reduce the possibility of fire.

(2) *GRINDING WHEELS AND GUARDS.* Never use a grinding wheel without wheel guards around the grinding wheel.

(3) *GOGGLES.* Goggles should always be worn when using a grinder, hand or power drill, welding, chipping metal or concrete, driving out rivets, or when driving nails.

(4) *AUTO STANDS.* Always place adjustable auto stands underneath the car or truck for protection in case of jack failure or for the possibility of the jack slipping off the axle.

(5) HOISTS. All hoists should be of sufficient size and capacity to lift the car or truck to be worked on. Make sure that the hooks or chains being used to lift the car or truck are ample in size and free from cracked or damaged links.

(6) *LIFTS.* A safety device should be used to prevent injury in case of lift failure. The rated capacity of the lift should be determined in order to prevent accidents from overloading.

(7) *FLOORS.* Never allow oil or grease to accumulate on the floor. If grease or oil is spilled on the floor, wipe it up immediately to prevent the possibility of someone slipping and falling.

(8) *DRIVING AND MOVING VEHICLES INSIDE BUILDING.* When driving or moving vehicles inside of building, the utmost caution should be observed. Be on the alert for people who might unexpectedly step in your way. Always look to the rear before backing a vehicle to make sure that no person, material, or equipment is in the way.

(9) *CARBON MONOXIDE GAS.* Do not run an engine for a long period of time without using an exhaust tube connected to the exhaust tail pipe to dispose of exhaust gases. Carbon monoxide fumes are injurious to health, and might prove fatal in a closed room.

(10) *FIRE PROTECTION.* Local ordinances dealing with fire protection should be strictly complied with at all times. Local fire departments will cooperate fully in recommending additional fire prevention methods for battery charging rooms, paint spray booth, etc.

(11) *MUSHROOM HEADS.* Mushroom heads on hand tools, such as hammers, chisels, drifts, etc., are dangerous, and should be repaired or exchanged for new tools.

(12) *FIRST AID.* Employees should be thoroughly convinced of the importance of first aid treatment immediately after injury to prevent infection.

Trouble Shooting Foreword

Purpose.

Trouble Shooting or diagnosis is required before any actual repairs can be made. The correct diagnosis prevents costly unnecessary repairs, and shortens the time the vehicle is out of service. Every serviceman who meets owners must be able to diagnose troubles both quickly and correctly, and the procedures outlined in the trouble shooting service bulletins take into account all of the possible causes of the trouble and provide a complete and correct diagnosis in the shortest possible time.

Who Will Use the Trouble Shooting Bulletins.

The trouble shooting service bulletins will be used by each man who contacts owners. This will include: The Service Manager, Shop Foreman, Floormen, Order Writers, and Tune-up Men.

Tune-up.

All of the elements of the old engine tune-up have been included in operation MA-1-B (5,000-mile inspection, preventive maintenance and lubrication service). In most cases, the owner requesting a tune-up does so because he is either experiencing trouble or because he feels that he will prevent future trouble. If he is trying to avoid trouble he needs preventive maintenance service, operation MA-1-B, since the engine tune-up did not provide for inspection, adjustment, or correction of the other units of the vehicle whereas operation MA-1-B does. If the owner is already experiencing trouble, and the 5,000-mile service is due, or nearly due, this operation should be performed first. If the trouble still exists, diagnose and correct the complaint, following the procedures given, omitting those steps that are a part of operation MA-1-B.

Tune-up Versus Trouble Shooting.

Tune-up instructions were based on the assumption that, if one factor of performance causes trouble, it can be assumed that all other factors are at least approaching failure, and that, regardless of the immediate trouble, the whole unit or system should be tested and repaired.

In a tune-up, when working on ignition, the procedure starts at the battery and carries on through the primary circuit, the distributor, and, finally, the high tension circuit.

In trouble shooting, the first test would be at the high tension wires to determine if a spark is available at the spark plugs, thus either locating the trouble in the ignition system or eliminating the entire ignition system from further consideration.

Arrangement.

For quick identification, trouble shooting service bulletins are all printed on yellow paper, and have a "Trouble Shooting Service Bulletin" heading (see above). In each case, the last number of the particular part number group concerned has been used as the subject number. This results in the trouble shooting sheets all being filed in back of all other bulletins in the same part number group.

Unless otherwise indicated, all trouble shooting instructions apply to the complete line of cars and trucks, all years, and all models. Where the instructions vary for different models, the necessary notes and exceptions are made in the text of the instructions.

To permit cross references and to avoid duplication, the trouble shooting instructions are divided into various subjects as outlined below, and, in addition, under each subject, the possible troubles are separated into symptoms, each of which is assigned a symptom number consisting of the subject number plus a letter.

Cross References.

It will be noted that throughout the trouble shooting procedures both operation (opr.) numbers and symptom (sym.) numbers are referred to. In these cases, the procedure referred to is to be followed. The symptom numbers will be found in the yellow pages under the subject number agreeing with the symptom number, and the operation numbers will be found on the regular bulletin sheets or the "Suggested Time Schedule."

Equipment.

In so far as possible, the trouble shooting instructions have been worked out so that little or no equipment is required. This will permit the instructions to be followed when rendering road service. Throughout these instructions it is assumed that the reader is familiar with the use of the Ford Laboratory Test Set or the Diagnosis Test Set and Distributor Stroboscope, and when the instructions call for the use of an ammeter or voltmeter he will use this equipment.

In the various electrical tests jumper wires and test lamps are specified. These can be made up and will prove of value in rendering road service. However, in most cases where a jumper wire is called for an ammeter may be used. Or when a trouble lamp is specified a voltmeter may be used.

How to Find the Symptom.

To locate the procedure required, turn to the subject number in the part number group concerned, and leaf through all of the yellow pages, observing the symptom names until the desired symptom is located. Follow the procedure given under that symptom number.

Working Procedures.

Trouble shooting procedures are working procedures and no more "good" reading than is a dictionary. In following these procedures, as a result of each test or operation, two or more different conditions always result (otherwise there would be no

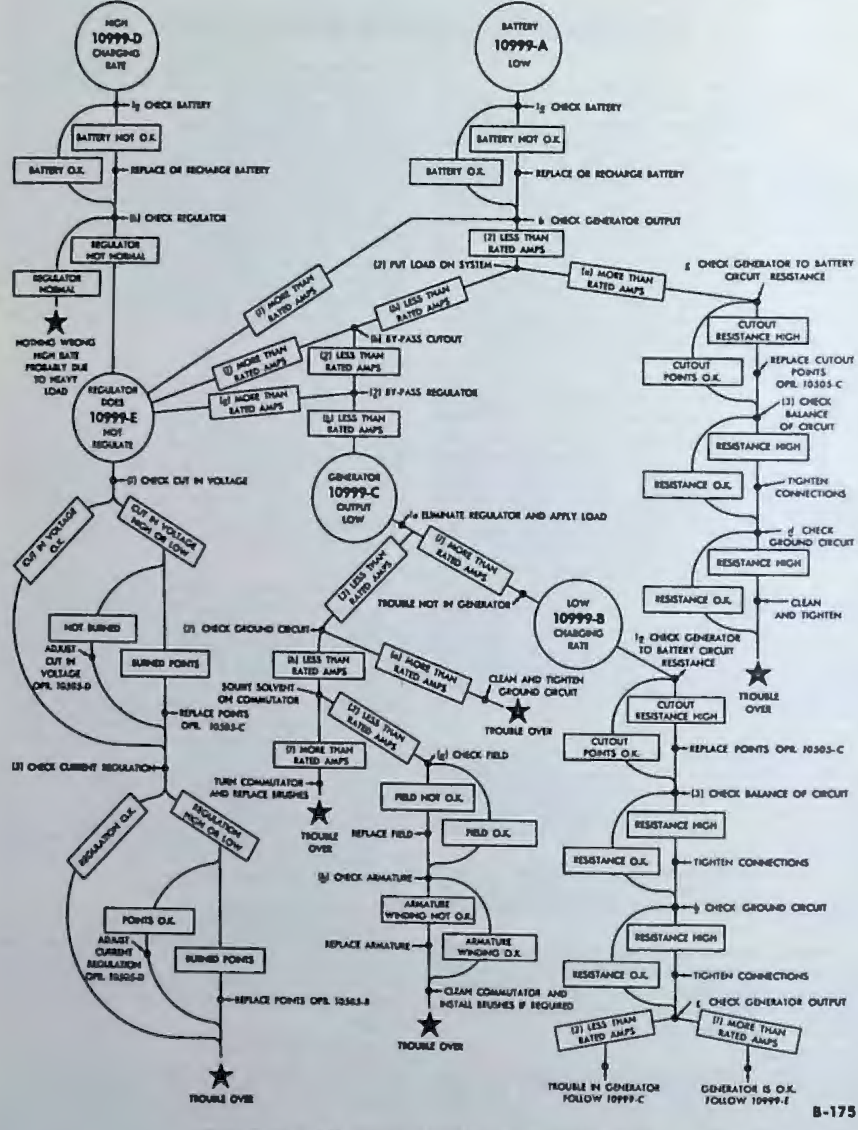

Figure 1—Generating System Trouble Shooting Road Map

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purpose for the test). Only one of these possible conditions will be true on the particular car being worked on, and what is said about the other conditions has no bearing on the particular car being worked on and should not even be read.

When following these procedures only read and do what is said for the circumstance existing on the particular car.

Following these procedures can be compared to following a road map. You start by knowing where you are and where you plan to go. At each intersection or fork in the road, you decide which road provides the shortest route to where you are going and take that road. If you explore all of the side roads or misread the road signs, you either have to come back to your one logical route or else you never do reach your destination. Any time spent off the main route is lost time. The same is true of these trouble shooting procedures, except:

(1) You may not know where you are starting from. Usually the owner tells you what he "thinks" the trouble is, but his description may not be correct. In most of these procedures, the first steps are to "establish the facts." In addition, if the wrong symptom is selected, it will lead you to the correct symptom.

(2) You never know where you are going. (If you knew what was wrong you wouldn't have to "trouble shoot.") Trouble shooting procedures require an open mind. You are not trying to confirm what you may have previously guessed. Each conclusion is definitely proven before proceeding with the next step.

(3) There are no trunk lines in trouble shooting procedures, the "route" or order of procedure changes as a result of each test. In trouble shooting the purpose is to eliminate as much as possible from further consideration.

EXAMPLE: ***In some engine symptoms the first step is to check the output of the ignition system from the end of the spark plug wires. If the spark is good, the entire ignition system is dropped from further consideration. The next step then is to check cylinder compression. If the compression is OK, the trouble must be in the fuel system. Thus, by these two tests, we know the ignition and the mechanical condition cannot possibly be the cause of trouble, so the trouble has to be in the fuel system.***

In preparing these procedures, what can be compared to a road map was laid out. Figure 1 is such a drawing for the battery and generating system. A study of this drawing will show every possible fault in this system has been taken into account and a test has been provided to uncover each. The various steps are numbered to agree with the paragraph numbers in the particular symptoms involved.

In this system five different symptoms are possible as shown in the five circles. Combinations of things can be wrong and each in turn will be corrected during the procedure. Regardless of the route, each procedure ends with a star indicating the trouble will have been corrected at that point.

Assuming a car came in with dirty commutator points, you don't know what is wrong, of course, but the battery will have run down. That one fact both the owner and you will know. Following the procedure for symptom 10999-A, "Battery Low" and leaving out the things that by your own tests you are not interested in, what you will do is traced by the arrow on the illustration in figure 2 and is as follows:

1. SYMPTOM 10999-A PROCEDURE

Adjust or replace the fan belt if required.

a. Recharge or Replace the Battery.

Recharge the battery if its specific gravity is below 1250. Replace the battery if a high discharge test after charge indicates it is worn out or under capacity.

b. Check Generator Output.

Disconnect the regulator battery wire and connect an ammeter in series at this point (positive to BAT terminal of regulator).

Start the engine and run it at approximately 1500 revolutions per minute. Observe the ammeter and follow (2).

(2) *LESS THAN RATED AMPERES.* If the ammeter shows less than the rated amperes, turn the headlights on, and press the starter button to establish an electrical load, and follow *(b)*.

(b) LESS THAN RATED AMPERES. If the ammeter still shows less than the rated amperes (engine speed 1500 revolutions per minute, starter and lights on), disconnect the ammeter lead from the BAT terminal of the regulator and connect it to the ARM terminal of the regulator, and follow *(2)*.

(2) LESS THAN RATED AMPERES. If the ammeter still shows less than the rated amperes, connect a jumper wire from the ARM to the FIELD terminals of the generator. Follow *b*.

b. Less Than Rated Amperes. If the ammeter still shows less than the rated amperes, the trouble exists in the generator. Follow procedure in Symptom 10999-C.

1. SYMPTOM 10999-C PROCEDURE

a. Check Generator Output.

Connect a jumper wire from the armature terminal to the field terminal of the generator. Disconnect the ARM wire at the regulator. Run the engine approximately 1500 revolutions per minute. Connect the ammeter positive lead to the armature terminal of the generator and the negative lead to the battery negative post. Turn the headlights on, and press the starter button. Observe the amperage, and follow (2).

(2) *LESS THAN RATED AMPERES.* If the ammeter reading is less than the rated amperes, connect a jumper wire from the battery positive post to the generator frame, and follow *(b)*.

(b) LESS THAN RATED AMPERES. If the ammeter reading is less than the rated amperes, squirt some carbon tetrachloride on the generator brushes while the generator is running, and follow *(1)*.

(1) MORE THAN RATED AMPERES. If the ammeter shows the rated amperes or more, clean the commutator, and clean and/or replace the generator brushes.

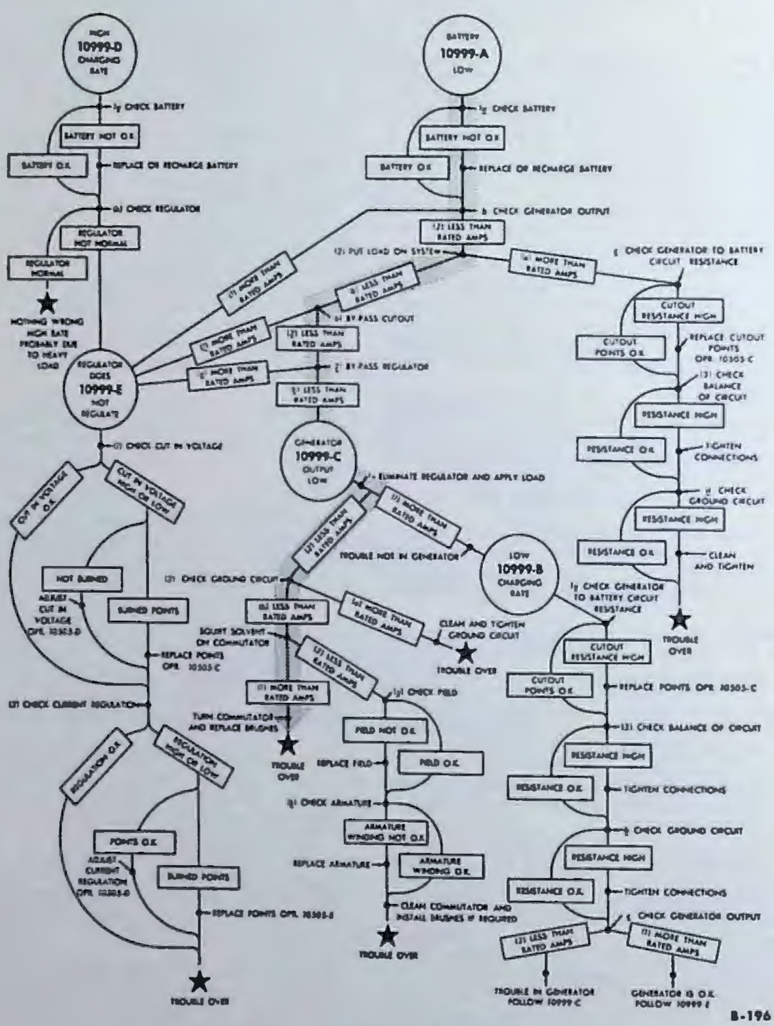

Figure 2—How Dirty Commutator Is Detected and Corrected

Wheel Specifications

WHEEL PART NUMBERS		Wheel Type	Rim Type*	Diameter of Bolt Circle (Inches)	Number of Bolts
Wheel Assembly	Wheel Ring				
B-1015	—	3.25-D (18x3¼)	D.C.	5½	5
BB-1015-D	—	3.75-P (20x5)	S.R.R.	8	5
BB-1015-E	—	4.33-R (20x6)	S.R.R.	8	5
40-1015-A	—	3.25-D (17x3¼)	D.C.	5½	5
48-1015-A	—	4.00-E (16x4)	D.C.	5½	5
51-1015-A	—	5.00-S (20x7)	C.R.R.	8	5
68-1015-A	—	4.00-E (16x4)	D.C.	10¼	5
70-1015-A	—	5.00-S (18x7)	C.R.R.	8	5
70-1015-C	—	6.00-T (18x8)	C.R.R.	8	5
74-1015	—	3.50-T (16x3½)	D.C.	10¼	5
81T-1015	—	4.33-R (20x6)	C.R.R.	8	5
91D-1015	—	5.00-E (16x5)	D.C.	10¼	5
91T-1015-A	—	5.00-S (20x7)	D.C.	8	5
91T-1015-B	—	5.00-S (20x7)	D.C.	8	5
01A-1015	—	4.00-E (16x4)	D.C.	5½	5
01AS-1015	—	3.62-P (18x3⅝)	D.C.	5½	5
022A-1015	—	3.50-D (16x3½)	D.C.	5½	5
06H-1015	—	4.00-E (16x4)	D.C.	5½	5
09B-1015	—	6.00-T (18x8)	C.R.R.	8	5
11Y-1015-A	—	4.33-R (17x6)	C.R.R.	6⅜	5
11Y-1015-B	—	3.75-P (17x5)	C.R.R.	6⅜	5
16H-1015	—	5.00-E (16x5)	D.C.	5½	5
19A-1015	—	5.00-E (16x5)	D.C.	5½	5
21T-1015	—	5.00-S (18x7)	C.R.R.	8	5
26H-1015	—	5.00-E (15x5)	D.C.	5½	5
29A-1015	—	5.00-E (15x5)	D.C.	5½	5
59C-1015	—	4.50-E (16x4½)	D.C.	5½	5
8C-1015	—	16x4½K	D.C.	5½	5
7RD-1015-B	—	16x6L	D.C.	6½	8
8J-1015	8J-1099	16x5.50F	S.D.C.	6½	8
7RY-1015	7RY-1099	17x5.50F	2 pc	6½	8
7RTL-1015	7RTL-1099	18x5.0	2 pc	8	5
7RT-1015-A	7RT-1099-A	20x5.0	2 pc	8	5
7RT-1015-B	7RT-1099-B	20x6.0	2 pc	8	5
7EQ-1015-B	7EQ-1099	20x6.5	2 pc	10	8
7EQH-1015	7EQH-1021 7EQH-1099	20x7.0	3 pc	10	8
8A-1015-C	—	16x4½K	D.C.	4	5
8A-1015-D	—	15x5K	D.C.	4	5
8A-1015-E	—	15x4½K	D.C.	4	5
8M-1015	—	15x5½K	D.C.	5	5
8L-1015-B	—	15x6L	D.C.	5	5

*D.C.—Drop Center.
S.R.R.—Split Retaining Rim.
C.R.R.—Continuous Retaining Rim.

*S.D.C.—Semi-Drop Center.
2 pc—2 Piece Advance Wide Base Rim.
3 pc—3 Piece Advance Wide Base Rim.

Tire Specifications

Tire Size and Ply Rating	Inflation Pressure for Maximum Load P.S.I.	Maximum Load Capacity (Pounds)	Static Loaded Radius	Revolution Per Mile	Wheel Part Number	Wheel Type
5.25x18—4	32	1000	13.9	727	B-1015	3.25-D (18x3¼)
5.50x16—4	30	810	12.8	787	022A-1015	3.50-D (16x3½)
5.50x16—6	36	900	12.9	782	022A-1015	3.50-D (16x3½)
5.50x16—4	30	810	12.8	787	74-1015	3.50-D (16x3½)
5.50x16—6	36	900	12.9	782	74-1015	3.50-D (16x3½)
5.50x17—4	32	955	13.7	736	40-1015-A	3.25-D (17x3¼)
6.00x16—4	28	915	13.3	758	48-1015-A	4.00-E (16x4)
6.00x16—6	36	1065	13.3	758	48-1015-A	4.00-E (16x4)
6.00x16—4	28	915	13.3	758	68-1015-A	4.00-E (16x4)
6.00x16—6	36	1065	13.3	758	68-1015-A	4.00-E (16x4)
6.00x16—4	28	915	13.3	758	01A-1015	4.00-E (16x4)
6.00x16—6	36	1065	13.3	758	01A-1015	4.00-E (16x4)
6.00x17—6	50	1250	14.5	695	11Y-1015-B	3.75-P (17x5)
6.00x18—4	32	1070	14.6	694	01AS-1015-A	3.62-P (18x3⅝)
6.00x18—6	36	1205	14.8	682	01AS-1015-A	3.62-P (18x3⅝)
6.00x20—6	50	1400	16.0	632	BB-1015-D	3.75-P (20x5)
6.00x20/30x5—8	70	1700	16.1	627	BB-1015-D	3.75-P (20x5)
6.50x15—4	28	1005	13.0	776	29A-1015	5.00-E (15x5)
6.50x15—6	36	1165	13.0	776	29A-1015	5.00-E (15x5)
6.50x16—4	28	1050	13.5	747	48-1015-A	4.00-E (16x4)
6.50x16—6	36	1215	13.5	747	48-1015-A	4.00-E (16x4)
6.50x16—4	28	1050	13.5	747	68-1015-A	4.00-E (16x4)
6.50x16—6	36	1215	13.5	747	68-1015-A	4.00-E (16x4)
6.50x16—4	28	1050	13.5	747	01A-1015	4.00-E (16x4)
6.50x16—6	36	1215	13.5	747	01A-1015	4.00-E (16x4)
6.50x16—6	36	1215	13.5	747	59C-1015	4.50-E (16x4½)
6.50x16—4	28	1050	13.5	747	19A-1015	5.00-E (16x5)
6.50x16—6	36	1215	13.5	747	19A-1015	5.00-E (16x5)
6.50x17—6	50	1500	15.0	672	11Y-1015-B	5.00-E (17x5)
6.50x20—6	50	1700	16.5	610	BB-1015-D	3.75-P (20x5)
6.50x20/32x6—8	65	1950	16.5	610	BB-1015-D	3.75-E (20x5)
7.00x15—4	26	1095	13.6	741	26H-1015	5.00-E (15x5)
7.00x15—6	36	1330	13.6	741	26H-1015	5.00-E (15x5)
7.00x16—4	26	1145	14.1	715	48-1015-A	4.00-E (16x4)
7.00x16—4	26	1145	14.1	715	68-1015-A	4.00-E (16x4)
7.00x16—4	26	1145	14.1	715	06H-1015	4.00-E (16x4)
7.00x16—6	36	1395	14.1	715	06H-1015	4.00-E (16x4)
7.00x16—4	26	1145	14.1	715	16H-1015	5.00-E (16x5)
7.00x16—6	36	1395	14.1	715	16H-1015	5.00-E (16x5)
7.00x16—4	26	1145	14.1	715	91D-1015	5.00-E (16x5)
7.00x16—6	36	1395	14.1	715	91D-1015	5.00-E (16x5)
7.00x16—4	26	1145	14.1	715	19A-1015	5.00-E (16x5)
7.00x16—6	36	1395	14.1	715	19A-1015	5.00-E (16x5)
7.00x17—6	45	1550	15.4	655	11Y-1015-A	4.33-R (17x6)

June 9, 1948

Tire Specifications (continued)

Tire Size and Ply Rating	Inflation Pressure for Maximum Load P.S.I.	Maximum Load Capacity (Pounds)	Static Loaded Radius	Revolution Per Mile	Wheel Part Number	Wheel Type
7.00x17—8	55	1725	15.4	655	11Y-1015-A	4.33-R (17x6)
7.00x20—8	55	1950	16.9	597	BB-1015-E	4.33-R (20x6)
7.00x20/32x6—10	70	2250	17.0	592	BB-1015-E	4.33-R (20x6)
7.00x20—8	55	1950	16.9	597	81T-1015	4.33-R (20x6)
7.00x20/32x6—10	70	2250	17.0	592	81T-1015	4.33-R (20x6)
7.50x17—8	55	2000	16.0	632	11T-1015-A	4.33-R (17x6)
7.50x18—8	55	2100	16.5	611	70-1015-A	5.00-S (18x7)
7.50x18/32x7—10	75	2500	16.6	607	70-1015-A	5.00-S (18x7)
7.50x18—8	55	2100	16.5	611	21T-1015	5.00-S (18x7)
7.50x18/32x7—10	75	2500	16.6	607	21T-1015	5.00-S (18x7)
7.50x20—8	55	2250	17.5	576	51-1015-A	5.00-S (20x7)
7.50x20/34x7—10	75	2700	17.6	573	51-1015-A	5.00-S (20x7)
7.50x20—8	55	2250	17.5	576	91T-1015-A	5.00-S (20x7)
7.50x20/34x7—10	75	2700	17.6	573	91T-1015-A	5.00-S (20x7)
8.25x18—10	60	2550	17.1	589	70-1015-C	6.00-T (18x8)
8.25x18—10	60	2550	17.1	589	09B-1015	6.00-T (18x8)
8.25x20—10	60	2750	18.1	557	51-1015-A	5.00-S (20x7)
8.25x20—12	75	3150	18.2	554	51-1015-A	5.00-S (20x7)
8.25x20—10	60	2750	18.1	557	91T-1015-A	5.00-S (20x7)
8.25x20—12	75	3150	18.2	554	91T-1015-A	5.00-S (20x7)
6.00x16—4	28	915	13.4	738	8C-1015	16x4½K
6.00x16—6	36	1065	13.4	738	8C-1015	16x4½K
6.50x16—6	36	1215	13.5	731	8C-1015	16x4½K
6.50x16—6	36	1215	13.4	735	7RD-1015-B	16x6L
7.00x16—6	36	1395	14.3	693	7RD-1015-B	16x6L
7.50x16—6	36	1560	14.7	673	7RD-1015-B	16x6L
7.00x16-6	45	1440	14.5	683	8J-1015	16x5½F
7.50x16—6	45	1650	14.9	667	8J-1015	16x5½F
7.50x16—8	55	1860	14.9	667	8J-1015	16x5½F
7.00x17—6	45	1575	15.3	654	7RY-1015	17x5½
7.00x17—8	55	1775	15.3	654	7RY-1015	17x5½
7.50x17—8	60	2100	15.9	625	7RY-1015	17x5½
6.50x20—6	50	1700	16.3	609	7RT-1015-A	20x5
7.00x18—8	55	1850	15.9	625	7RTL-1015	18x5
7.00x20—8	55	2000	16.8	591	7RT-1015-A	20x5
6.50x20—8	65	1950	16.3	609	7RT-1015-A	20x5
7.00x20—10	70	2250	16.9	590	7RT-1015-A	20x5
7.50x20—8	60	2375	17.5	570	7RT-1015-B	20x6
7.50x20—10	75	2700	17.6	567	7RT-1015-B	20x6
8.25x20—10	65	2900	18.2	546	7RT-1015-B	20x6
8.25x20—10	65	2900	18.2	546	7EQ-1015-B	20x6½
9.00x20—10	65	3450	19.1	520	7EQ-1015-B	20x6½
9.00x20—10	65	3450	19.1	520	7EQH-1015	20x7
10.00x20—12	70	4000	19.5	509	7EQH-1015	20x7

Tire Specifications (continued)

Tire Size and Ply Rating	Inflation Pressure for Maximum Load P.S.I.	Maximum Load Capacity (Pounds)	Static Loaded Radius	Revolution Per Mile	Wheel Part Number	Wheel Type
6.00x16—4	28/25	915/855	—	—	8A-1015-C	16x4½K
6.70x15—4	24/21	920/850	—	—	8A-1015-E	15x4½K
7.10x15—6	25/30	1015/1130	—	—	8A-1015-D	15x5K
7.10x15—4	24	990	—	—	8M-1015	15x5½K
7.10x15—6	30	1130	—	—	8M-1015	15x5½K
8.20x15—4	24	1225	—	—	8L-1015-B	15x6L

June 9, 1948

1102-1126—DRUMS

Part Number	Inside Diameter (Inches)	Regrinding Limits (Inches on Diameter)	Brake Lining To Drum Clearance
81B-1102	15 1/8		
81T-1102	15 1/8		
82Y-1102	12		
91T-1102	14		
01Y-1102	12		
09B-1102	14 1/2		
59Y-1102	12		
8D-1102	12		
81B-1103	15 1/8		
81T-1103	15 1/8		
82Y-1103	12		
91T-1103	14		
01Y-1103	12		
09B-1103	14 1/2		
59Y-1103	12		
21A-1105-A	12		
21D-1105-A	12		
51A-1105-A	12		
59D-1105-A	12		0.010

Part Number	Inside Diameter (Inches)	Regrinding Limits (Inches on Diameter)	Brake Lining To Drum Clearance
8A-1125-B	10		
8C-1125	11		
8D-1125	12		
8L-1125	12	0.030	0.010
7RT-1125-C	14		
7EQ-1125-B	16		
8Y-1125	12		
8M-1125	11	0.030	0.010
8A-1126-B	10		0.010
8A-1126-C	11		0.010
8C-1126	11		
8D-1126	12		
8L-1126	12	0.030	0.010
8M-1126	11	0.030	0.010
8Y-1126	14		
7RT-1126-A	15		
7EQH-1126	16		
7EQ-1126-B	16 1/4		

2018-2370—FOREWARD OR PRIMARY BRAKE SHOE

Part Number	LINING					
	Length (Inches)	Width (Inches)	Thickness—(Inches) Rough Finish	Thickness—(Inches) Installed	Original Depth of Lining To Rivets (Inches)	Wear Limit Depth of Lining To Rivets (Inches)
81T-2018	19 1/8	2 1/2	0.258-0.278	1/4	0.137	1/32
91D-2018	13 1/2	1 23/32	0.195-0.205	3/16	0.095	1/32
91T-2018-A	16 21/32	3 1/2	0.330-0.340	5/16	0.190	1/32
92Y-2018-A	15 17/32	2	0.268-0.278	1/4	0.137	1/32
01A-2018	13 1/8	1 23/32	0.195-0.205	3/16	0.137	1/32
51A-2018	13 1/8	1 23/32	0.195-0.205	3/16	0.137	1/32
59C-2018	13 1/2	1 23/32	0.195-0.205	3/16	0.095	1/32
86H-18377	13	1 3/4	0.196-0.216	3/16	0.137	1/32
06H-18377	13	1 3/4	0.196-0.216	3/16	0.137	1/32
7EQ-2018	16 13/32	2 1/4	0.253-0.273	1/4	0.145	1/32
7EQH-2218-B*	17	5	0.38-0.40	3/8	0.235	1/32
7EQ-2370*	15 1/2	3 1/2	0.375-0.395	3/8	0.203	1/32
8A-2018-C	11 3/4	2 1/4	0.204-0.224	3/16	0.124	1/32
8C-2018*	11 29/32	2	0.202-0.222	3/16	0.124	1/32
8J-2018	14 9/16	2	0.245-0.255	1/4	0.164	1/32
8L-2018	12 15/16	2 1/4	0.202-0.222	3/16	0.124	1/32
8M-2018	11 15/16	2	0.202-0.222	3/16	0.124	1/32
8A-2218-D	11 3/4	1 3/4	0.204-0.224	3/16	0.124	1/32
8C-2218	11 29/32	1 3/4	0.202-0.222	3/16	0.124	1/32
8L-2218	12 15/16	2	0.202-0.222	3/16	0.124	1/32
8M-2218	11 15/16	1 3/4	0.202-0.222	3/16	0.124	1/32

*Used for both front and rear shoes.

2019-2219—REAR OR SECONDARY BRAKE SHOE

Part Number	LINING					
	Length (Inches)	Width (Inches)	Thickness—(Inches) (Rough Finish)	Thickness—(Inches) Installed	Original Depth of Lining To Rivets (Inches)	Wear Limit Depth of Lining To Rivets (Inches)
B-2019	15 11/16	1 1/2	0.175-0.185	3/16	0.137	1/32
BB-2019	18 1/8	2 1/16	0.235-0.245	1/4	0.095	1/32
48-2019-B	13 9/16	1 23/32	0.182-0.192	3/16	0.137	1/32
51-2019-A	17 3/16	2 1/2	0.250-0.260	1/4	0.137	1/32
78-2019-F*	13 9/16	1 23/32	0.195-0.205	3/16	0.137	1/32
81B-2019	19 1/8	2 1/2	0.268-0.278	1/4	0.137	1/32
81T-2019-A	19 1/8	2 1/2	0.268-0.278	1/4	0.137	1/32
81T-2019-B	19 1/8	2 1/2	0.268-0.278	1/4	0.137	1/32
91B-2019	11 9/16	3 1/2	0.330-0.340	5/16	0.137	1/32
91T-2019-A	11 3/16	3 1/2	0.330-0.340	5/16	0.190	1/32
92Y-2019-A	10 3/4	2	0.268-0.278	1/4	0.137	1/32
01A-2019	10	1 23/32	0.195-0.205	3/16	0.137	1/32
09B-2019-C	7 11/32	4	0.740-0.760	3/4	0.137	1/32
51A-2019	10	1 23/32	0.195-0.205	3/16	0.137	1/32
59C-2019	10 3/8	1 23/32	0.195-0.205	3/16	0.095	1/32
8C-2019	11 29/32	2	0.202-0.222	3/16	0.124	1/32
8J-2019	12 1/4	2	0.245-0.255	1/4	0.164	1/32
8A-2219-D	11 3/4	1 3/4	0.204-0.224	3/16	0.124	1/32
8C-2219	14 15/32	1 3/4	0.202-0.222	3/16	0.124	1/32
86H-18377	13	1 3/4	0.196-0.216	3/16	0.137	1/32
06H-18377	13	1 3/4	0.196-0.216	3/16	0.137	1/32
7EQ-2019	12 3/16	2 1/4	0.253-0.273	1/4	0.145	1/32
8A-2019-C	11 3/4	2 1/4	0.204-0.224	3/16	0.124	1/32
8L-2019	12 15/16	2 1/4	0.202-0.222	3/16	0.124	1/32
8M-2019	11 15/16	2	0.202-0.222	3/16	0.124	1/32
8L-2219	12 15/16	2	0.202-0.222	3/16	0.124	1/32
8M-2219	11 15/16	1 3/4	0.202-0.222	3/16	0.124	1/32

*Used for both front and rear shoes.

June 8, 1948

2061-2062—FRONT BRAKE WHEEL CYLINDER

Part Number	BORE			
	Large End Mfg. Maximum Diameter (Inches)	Hone Limit Diameter (Inches)	Small End Mfg. Maximum Diameter (Inches)	Hone Limit Diameter (Inches)
91A-2061—R.H.	1.253	1.257	1.003	1.005
91A-2062—L.H.	1.253	1.257	1.003	1.005
96H-2061—R.H.	1.128	1.132		
96H-2062—L.H.	1.128	1.132		
21A-2062—L.H.	1.378	1.382	1.003	1.005
21A-2061—R.H.	1.378	1.382	1.003	1.005
8C-2061-B—R.H.	1.0655	1.0675		
8C-2062-B—L.H.	1.0655	1.0675		
8J-2061—R.H.	1.378	1.382		
8J-2062—L.H.	1.378	1.382		
8M-2061-A—R.H.	1.128	1.132		
8M-2062-A—L.H.	1.128	1.132		
7EQ-2061—R.H.	1.253	1.257		

2609-2648—HAND BRAKE BAND

Part Number	LINING					
	Length (Inches)	Width (Inches)	Thickness—(Inches)		Original Depth of Rivets (Inches)	Wear Limit Depth of Rivets (Inches)
			Rough Finish	Installed		
BB-2609-A	44 1/8	1 1/2	0.180	3/16	0.137	1/32
01T-2648	24 5/8	2 1/2	0.240-0.250	1/4	0.137	1/32
09B-2648	11 1/8	2 1/2	0.230-0.250	1/4	0.137	1/32
8MB-2648	13 11/16	3	0.292-0.312	5/16	0.150	1/32
7EQ-2648-B	10	3	0.300-0.320	5/16	0.137	1/32
7EQ-2648-C	10	3	0.300-0.320	5/16	0.137	1/32

2140—BRAKE MASTER CYLINDER

Part Number	BORE	
	Mfg. Maximum Diameter (Inches)	Hone Limit Diameter (Inches)
91A-2140	1.065	1.0695
91T-2140	1.253	1.257
8A-2140-A	1.003	1.007
7EQ-2140	1.503	1.507
8M-2140-A	1.003	1.007

2261-2262—REAR BRAKE WHEEL CYLINDER

Part Number	BORE			
	Large End Mfg. Maximum Diameter (Inches)	Hone Limit Diameter (Inches)	Small End Mfg. Maximum Diameter (Inches)	Hone Limit Diameter (Inches)
91A-2261—R.H.	1.128	1.133	1.003	1.008
91T-2261	1.503	1.507	1.503	1.508
91A-2262—L.H.	1.128	1.133	1.003	1.008
92Y-2261	1.378	1.382	1.378	1.382
96H-2261—R.H.	1.003	1.005		
96H-2262—L.H.	1.003	1.005		
7EQH-2261-B	1.753	1.757		
8A-2261—R.H.	0.878	0.880		
8A-2262—L.H.	0.878	0.880		
8J-2261—R.H.	1.253	1.257		
8J-2262—L.H.	1.253	1.257		
8L-2261-A—R.H.	0.940	0.942		
8L-2262-A—L.H.	0.940	0.942		
8M-2261-A—R.H.	1.003	1.005		
8M-2262-A—L.H.	1.003	1.005		

June 8, 1948

Operation 2000-A
Minor Adjustments

A minor brake adjustment merely reestablishes the brake shoe to drum clearance. The need for an adjustment is revealed by a lack of pedal reserve (pedal goes too close to the floor board when the brakes are applied). If the brakes are uneven, a major adjustment (opr. 2000-B) rather than a minor adjustment is required.

1. PROCEDURE.

a. Determine if Minor Adjustment is Possible.

Remove one front wheel and examine for the following condition:

(1) Brake drum scored, out-of-round, or bell-mouthed.

(2) Lining oil-soaked.

(3) Lining worn to less than 1/32 inch from the rivet heads.

(4) Lining has not been making full contact with the drum.

If any of these conditions exist, a minor brake adjustment will not suffice—follow the procedure for the major adjustment, Operation 2000-B.

NOTE: *It may be assumed that the condition of the linings and drums at the other three wheels is approximately the same as found at the one wheel removed.*

If the lining and drum are satisfactory, proceed as follows:

b. Adjust Shoes.

Reinstall the wheel that was removed.

Raise all four wheels free of the floor.

Follow whichever of the following ((1), (2), (3), or (4)) that apply:

(1) FORD HYDRAULIC BRAKE (Passenger Cars and Trucks). Turn the adjusting cam for the forward shoe at one wheel in the direction shown by the arrow (fig. 1) until the shoe is tight against the drum. Then turn it back until the wheel turns freely by hand.

NOTE: *No set amount of clearance between lining and drum is specified for the brakes, the least amount possible is desirable.*

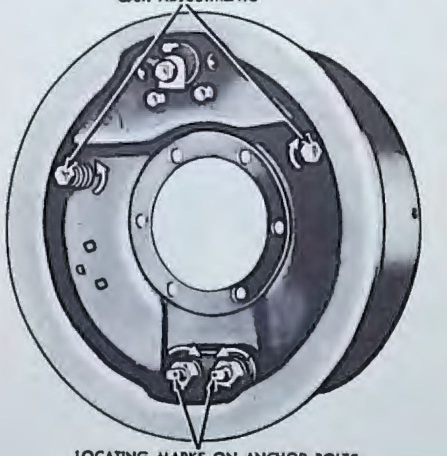

Figure 1—Brake Plate (Ford Hydraulic)

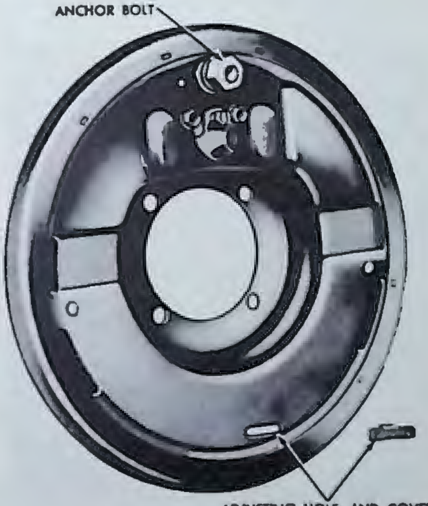

Figure 2—Brake Plate (Lincoln Hydraulic)

Adjust the cam for the reverse shoe in the same manner.

Repeat the same procedure as outlined above at the other three wheels. Check brake pedal (par. c below).

(2) *LINCOLN HYDRAULIC BRAKES.* Pry off the adjustment hole cover (fig. 2), and insert a screw driver through the adjustment hole until it contacts the notched wheel. Turn the notched wheel downward (move screw driver upward) until the drum can just be turned by hand (click can be heard each time the notched wheel is turned one notch), then back off the notched wheel 14 notches. Turn the wheel to make sure that there is no drag. Install adjustment hole cover. Follow the same procedure at the other wheels. Check brake pedal (par. c below).

(3) *FORD CABLE OR ROD CONTROLLED BRAKES (Passenger Cars and Trucks).* Turn the adjusting screw in (fig. 3) until the shoe is tight against the drum, then back off the adjusting screw until the wheel turns freely. Repeat the same procedure at the other three wheels. Set the hand-brake lever until the wheel with the least drag can be turned by hand.

NOTE: *On trucks do not set hand-brake lever, use a pedal jack to depress the brake pedal until the wheel with the least drag can just be turned by hand.*

Back off the adjusting screw on the tight brakes until the drag is equal at all wheels.

Figure 3—Brake Plate (Ford, Cable or Rod)

When testing for drag, turn the wheels at least a complete revolution. Check brake pedal (par. c below).

(4) *LINCOLN CABLE BRAKES.* Pry off the adjustment hole cover (fig. 4). Make sure that the drums are cool. Loosen the eccentric lock nut slightly, and turn the eccentric in the direction of the wheel's forward rotation until the brake drags. Back off on the eccentric only enough until the wheel turns freely. Hold the eccentric carefully in this position, and tighten the eccentric lock nut. Insert a screw driver or adjusting tool through the adjustment hole until it contacts the notched wheel. Turn the notched wheel toward the backing plate rim until the wheel can just be turned by hand, then back off the adjustment until the wheel turns freely. Repeat the same procedure at the other three wheels. Set the hand-brake lever or use a pedal jack until the wheel with the least drag can just be turned by hand. Back off the adjustment on the tight brakes until the drag is equal at all wheels. Install the adjustment hole covers. Check brake pedal (par. c below).

c. Check Brake Pedal.

Apply the brakes.

Measure the distance from the pedal pad to the floor board when the brakes are applied severely. If this distance is less than half the total travel, too much clearance exists between the shoes and the drums. Readjust the shoes more carefully.

On hydraulic brakes, if the pedal feels spongy, bleed the hydraulic system, or if the pedal has less than 1/4 inch, or more than 1/2 inch, free travel before the master cylinder piston starts to move (measured at the pedal pad), adjust the pedal rod.

Figure 4—Brake Plate (Lincoln, Cable)

May 17, 1947

Operation 2000-B
Major Adjustment

A major brake adjustment is recommended after installation of new or relined shoes, and in all cases where the brakes are uneven, or where satisfactory brakes are not obtained by a minor adjustment.

In the following instructions, operations in *italics* are not normally a part of the adjustment procedure, and an extra charge may be made.

1. PROCEDURE.

a. Inspection.

Remove all four brake drums.

(1) *INSPECT DRUMS.* If the drums are scored, out-of-round, or bell-mouthed, ***repair or replace the drums.***

(2) *INSPECT LININGS.* If the linings are oil soaked or worn to less than $\frac{1}{32}$ inch of the rivet heads, replace the lining. If the linings have not been making full contact with the drums, ***replace or reface the linings.***

(3) *LUBRICATE.* Lubricate the surfaces where the shoe contacts the backing plate, using high temperature white grease sparingly.

b. Operations While Drums are Removed.

While the drums are still removed, follow any of the following ((1), (2), (3)) that apply:

(1) *HYDRAULIC BRAKES ONLY.* Inspect the master cylinder and all wheel cylinders for leakage. If any cylinders show signs of leakage, ***repair or replace them.***

(2) *FORD CARS AND TRUCKS PRIOR TO 1939.* Make sure that the brake shoes are resting on the anchor. Set a brake concentricity gauge to the size of the drum, and install it on the spindle. Place the gauge over the entire braking surface of the linings. If the gauge drags at any point, back off the adjustment screw as required. Turn the adjustment screw until the clearance for the entire length of the lining at no point is greater than 0.015 inch or less than 0.005 inch. If these limits cannot be obtained by the means of the adjusting screw, it will be necessary to either adjust the anchor or ***replace or reline and grind the brake shoes.***

(3) *CABLE CONTROLLED CARS OR TRUCKS.* Disconnect each end of the brake cables. Clean the exposed portions of the cables thoroughly with a cloth dipped in kerosene. Pull the cables through the conduits at the brake ends to expose the portion normally covered by the conduit. These portions likewise should be thoroughly cleaned. Lubricate the cables with graphite grease, and pull them back and forth through the conduits several times.

c. Operations After Drums are Installed.

Install the drums and follow whichever of the following ((1), (2), or (3)) that apply:

(1) *ROD CONTROLLED CARS AND TRUCKS.*

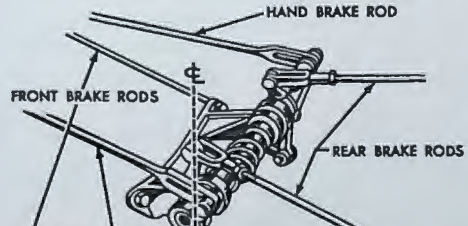

Figure 5—1932-1934 Ford Passenger Car Brake Cross Shaft

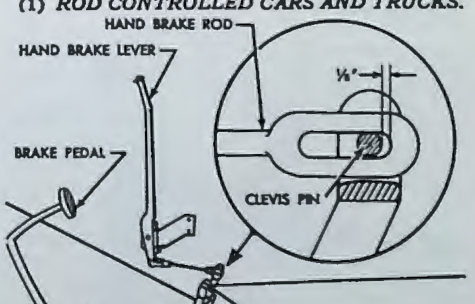

Figure 6—1935-1936 Ford Passenger Car Brake Cross Shaft

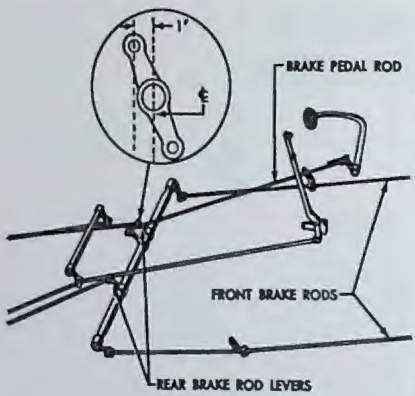

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Figure 7—1932-1934 Truck Brake Cross Shaft

Run in the adjustment screw at each brake until the shoes are tight in the drums.

(a) Adjust Cross Shaft Position. Disconnect all the brake rods from the cross shaft. Follow whichever of the following ((1), (2), (3), or (4)) that apply:

(1) 1932-1934 CARS. Adjust the brake pedal rod so that the brake cross shaft operating levers for the rear brake rods are directly above the operating levers for the front brake rods (fig. 5).

(2) 1935-1936 CARS. Adjust the brake pedal rod until the hand-brake rod slot is ⅛ inch from the clevis pin (fig. 6).

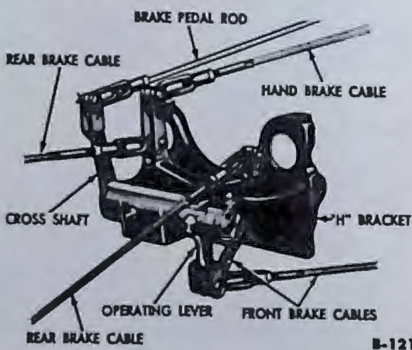

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Figure 8—1937-1938 Ford Passenger Car Brake Cross Shaft

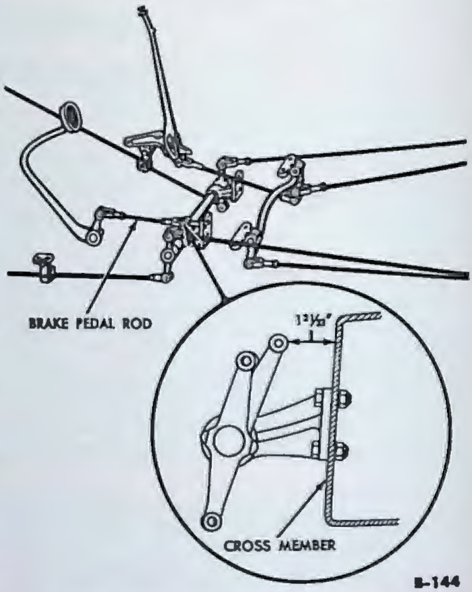

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Figure 9—1935-1937 Truck Brake Cross Shaft

(3) 1932-1934 TRUCKS. Adjust the brake pedal rod so that the cross shaft rear brake rod levers are one inch to rear of vertical (fig. 7).

(4) 1935-1937 TRUCKS. Adjust the brake pedal rod so that the stop on the pedal rod lever just clears the frame cross member. If the pedal rod lever is not provided with a stop, set the lever $1\frac{21}{32}$ inches from the frame cross member (fig. 9).

(b) Adjust Brake Rods. Push the brake lever at each wheel lightly toward the brake cross shaft to

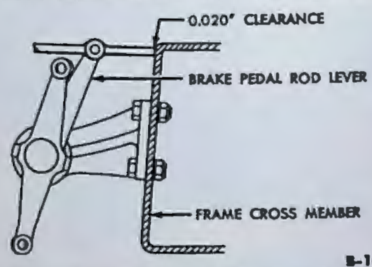

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Figure 10—1938 Truck Brake Cross Shaft take up any play in the brake cam, and adjust the rod at each wheel so that it is $\frac{1}{32}$ inch short. Install the clevis pins and new cotter pins. Back off the adjusting screws at each brake until all drag is removed.

(2) *CABLE CONTROLLED CARS AND TRUCKS.*

(a) ADJUST CROSS SHAFT POSITION. Follow whichever of the following ((1) or (2)) that applies:

(1) 1937-1938 FORD CARS. Adjust the brake pedal rod so that the cross shaft operating lever for the front brakes is resting against the bottom of the cross shaft bracket "H" as shown in figure 8.

(2) 1938 TRUCKS. Adjust the brake pedal rod so that the stop on the pedal rod lever is 0.020 inch from the frame cross member (fig. 10).

(b) ADJUST BRAKE CABLES.

(1) FORD CARS AND TRUCKS. Turn the adjusting screw in at each brake until the brake shoes are tight in the drums. Loosen the conduit clamps at the backing plate and at the frame bracket at all four brakes. While someone is holding the brake pedal down hard, tighten the conduit clamps at the backing plate and at the frame bracket at all four brakes. Adjust the cable clevis at each cable so that the clevis pin can be installed in the clevis and the brake lever while the brake pedal is held down lightly (approximately 25 pounds pressure). Back off the adjustment screws at each brake until all drag is removed.

(2) LINCOLN 1936-1938. Remove the adjustment hole cover at each brake plate (fig. 4). Expand the brake shoes at each of the four brakes by means of the notched adjusting wheel until the drums can just be turned by hand. Pull the cables by hand toward the cross shaft to remove all cable slack and lost motion at the cam levers. Adjust the clevises so that the clevis pins will just enter clevises and levers freely. Lock the clevis lock nuts, and install the clevis pin cotter pins. Release the notched adjusting wheel the same number of notches at each drum until brake drums are completely free of brake drag. Install the wheels on the drums. Install the adjustment hole covers.

(3) *ADJUST BRAKE SHOES.*

(a) 1937-1938 CARS—1938 TRUCKS. Loosen the anchor pin lock nut. Expand shoes into drum by turning the adjusting screw in, at the same time moving the anchor pin by turning slightly in both directions until the shoes have been expanded to maximum. Hold the anchor pin in position, and tighten the anchor pin lock nut, using a wrench with a 20-inch handle. Back off the adjusting screw until all drag is removed. Repeat the same procedure at the other three wheels.

(b) 1936-1938 LINCOLN. These are single anchor cable controlled brakes. Remove the wheels from all four drums. Insert a thickness gauge (0.010 inch) between the lining and drum through the slot in the brake drum (fig. 4). Loosen the anchor pin lock nut one turn, and tap the anchor in the necessary direction with a soft hammer to obtain 0.010 inch clearance between the lining and the drum. Loosen the eccentric adjustment lock nut, and turn the eccentric to obtain 0.010 inch clearance between the lining and the drum. Turn the notched wheel toward the brake plate rim until 0.010 inch clearance is obtained between the drum and the lining at the adjusting end of the shoes. Tighten the anchor pin lock nut securely with a 16-inch wrench. Tighten the eccentric lock nut. Recheck the clearance to make sure tightening the anchor lock nut has not disturbed the lining to drum clearance. Follow the same procedure at the other three brakes. By means of the hand-brake lever on cars, or a pedal jack on trucks, set the brakes to the point where the wheel with the least drag can just be turned by hand. Back off the adjustment screw on the tight brakes until the drag is equal at all wheels.

NOTE: ***When testing for drag, the wheels should be turned not less than complete revolutions.***

(c) ALL ADJUSTABLE DOUBLE ANCHOR BRAKES. The 1939-1942 Ford and Mercury passenger cars and the 1939-1947 Trucks are equipped with adjustable double anchor brakes, with the exception of the 1946-1947 Light Duty truck and the One-Ton truck front brakes. Adjust the cams until both the forward and reverse shoes are tight against the drum. Loosen the anchor lock nut (fig. 1), and see that the locating marks are toward each other. Turn both anchor bolts in the direction shown in figure 1 until the shoes touch the drum. Make sure that the anchor bolts are held as the nuts are tightened so that the setting will not be changed. Back off the cams until the wheel turns freely by hand. If the wheel does not turn freely, repeat the operation more carefully. Repeat the same procedure as outlined above at the other three wheels.

(d) All Floating Double Anchor Brakes. The 1946-1947 Ford and Mercury passenger cars and the Light Duty trucks are equipped with floating double anchor brakes, and apply to the front brakes only on the 1946-1947 One-Ton truck. Adjust the cams until both the forward and the reverse shoes are tight against the drum. Back off the cams until the wheel turns freely by hand. If the wheel does not turn freely, repeat the operation more carefully.

NOTE: *No set amount of clearance is specified for these brakes, the least amount possible is desirable.*

Repeat the same procedure at the other three wheels.

(4) *HYDRAULIC BRAKES, 1939-1947 LINCOLN.* These are single anchor brakes. Remove all four wheels. Remove the adjustment bole cover from each brake plate. Make sure that the drums are cool. Loosen the anchor bolt lock nut (fig. 2) one turn. Insert a 0.010 inch thickness gauge through the slot in the drum, and tap the anchor bolt up or down, whichever is necessary, with a soft hammer so that there is 0.010 inch clearance between the brake shoes and the drum at the anchor. Check the clearance all around the shoes with the thickness gauge, and adjust the notched wheel through the adjustment hole until 0.010 inch clearance between the brake shoes and the drum is obtained. Tighten the anchor pin lock nut with a wrench having a 16-inch handle. Repeat the same procedure at the other three brakes. Install wheels. Install adjustment hole covers on brake plates. Check the brake pedal (subpar. (5) below).

(5) *CHECK BRAKE PEDAL.* Measure the distance from the pedal pad to the floor board when the brakes are applied severely. If this distance is less than half the total travel, too much clearance exists between the shoes and the drums. Readjust the shoes more carefully. On hydraulic brakes, if the pedal feels spongy, bleed the hydraulic system. If the pedal has less than $\frac{1}{4}$ inch or more than $\frac{1}{2}$ inch free travel before the master cylinder piston starts to move (measured at the pedal pad), adjust the pedal rod.

Most of the expensive brake repairs you will encounter could have been avoided by preventive maintenance service.

May 17, 1947

F8 3-Ton Ford Truck Rear Brake

1. DESCRIPTION

The 16 inch by 5 inch extra heavy double cylinder, two shoe type brake is vacuum power operated type, and provides complete lining contact and multiple pressure due to wrapping action of both shoes in forward or reverse braking for extreme effectiveness.

The brake is a "floating shoe" type which has two identical shoes (fig. 2) arranged on the backing plate so that their toes are diagonally opposite. Two double-end wheel cylinders are arranged so that one cylinder is mounted between each shoe toe and heel. An equal amount of hydraulic force is thus applied at each end of each shoe. The wheel cylinders are not bolted directly to the backing plate; instead, they are held in position by shoe anchor blocks. The anchor blocks are bolted to the backing plate. Each anchor block serves as a shoe stop and shoe centering point, and provides the fulcrum around which the shoe pivots when the brake is applied (fig. 1).

Both shoes are always primary shoes (forward acting), independently actuated in either direction of rotation. Shoes anchor at either toe or heel depending

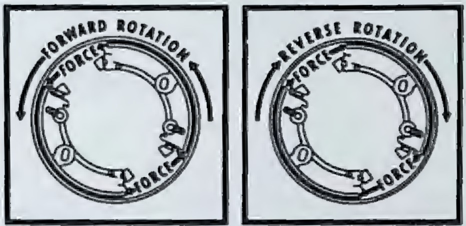


Fig. 1—Schematic View Showing Direction of Forces Upon Brake Application

upon the rotation of the brake drum. A pivot pad is placed at both shoe toe and shoe heel. The pad at the toe is an integral part of the shoe adjustment screw, a component of the adjusting mechanism which is placed in the shoe toe of this brake. The adjusting screw is held in the shoe toe by means of a worm wheel which threads onto the screw. The worm wheel, in turn, meshes with a worm which is rotated to effect brake adjustment. The worm has an Allen head so that it can easily be turned with a ⅜" Allen wrench.

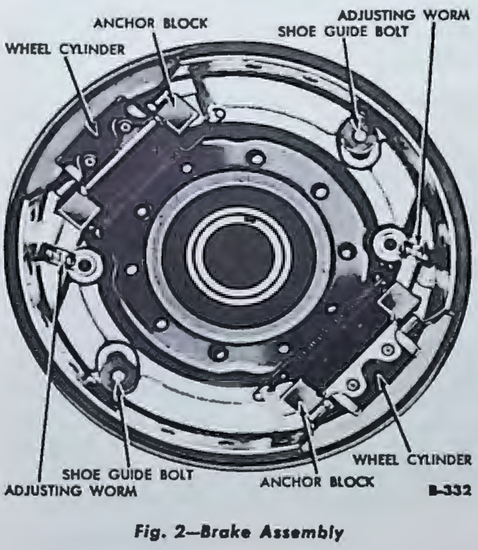


Fig. 2—Brake Assembly

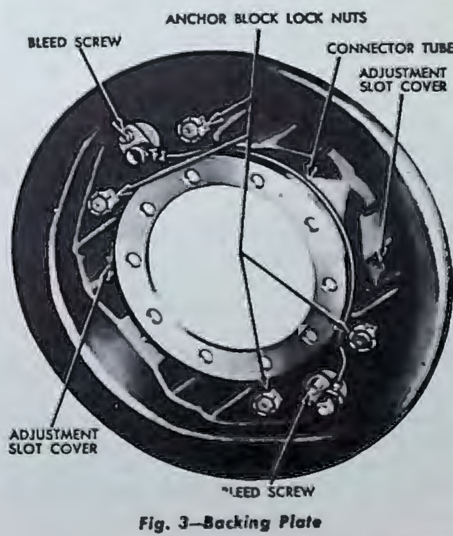


Fig. 3—Backing Plate

4. ADJUSTMENT

A brake adjustment is required when the shoes have been relined and, on occasion, to compensate for normal lining wear. The clearance between the lining and the brake drum should be sufficient to avoid "brakedrag" and yet close enough to provide a good "pedal reserve." The brakes require adjustment (or relining) when the "pedal reserve" is about 2 inches, that is, when the brake pedal pad moves to within 2 inches of the floor board on hard application of the brakes. Make all adjustments with the drums cooled to normal temperature. Make sure the wheel bearings are correctly adjusted.

Remove the adjusting slot covers from the backing plate (fig. 3). Insert the Allen wrench in the adjusting slot to contact the adjusting worm. Turn the wrench in the direction of FORWARD wheel rotation to decrease the lining to drum clearance. Reduce the clearance until the lining "drags" on the drum. Turn the wrench in the opposite direction, to increase the clearance, until drag is relieved. Then turn the wrench an additional turn to provide working clearance. Repeat the above procedure on the second shoe. Replace the adjustment covers. Repeat the above procedure on the other brake.

NOTE: *Adjustment may be made with the vehicle resting on jacks or on the road. On jacks, the brake drag is checked by "feel" rotating the drum in the direction of forward rotation as adjustment is made. If adjusted on the road, the brake drag is checked by sound, tapping the drum with a hammer to determine whether the liners are "dragging on the drum." When the liners contact the drum the sound is deadened.*

5. BLEEDING THE BRAKE SYSTEM

The self-centering Hi-Tork brakes are bled in a similar manner to other hydraulic brake systems. Bleed the wheel cylinders in the following order: The cylinder lowest to the road, and then the cylinder highest from the road. Remove the filler plug from the master cylinder reservoir, and fill the reservoir with hydraulic brake fluid. Attach a bleeder tube to the wheel cylinder bleeder screw. Insert the other end of the bleeder tube in a clean glass jar, containing some hydraulic fluid. Open the bleeder screw about ¾ of a turn. Pump the brake pedal slowly, some fluid or air will come out at each stroke of the pedal.

NOTE: *Keep the master cylinder reservoir filled with brake fluid while pumping the brake pedal.*

Continue to pump the brake pedal until all bubbles cease coming out of the bleeder tube. Close the bleeder screw, remove the bleeder tube. Repeat the above procedure at other wheel cylinders. Refill the master cylinder reservoir, and repeat the above procedure at the two wheel cylinders on the opposite brake.

6. BRAKE SPECIFICATIONS

Lining length, both linings (measured inside the arc)	17.60 in.
Lining width	5 in.
Lining thickness	⅜ in.
Adjusting worm, Allen wrench size	⅜ in.
Torque wrench specifications, shoe anchor block locking nut	178-219 pds. ft.

Brake Booster (51TS-18161-A)

A brake booster system, consisting of a brake booster, check valve, and remote protected air cleaner, is standard equipment on all 2-ton trucks and optional equipment on all 1½-ton trucks (figs. 1 and 2).

The brake booster consists of a vacuum power chamber, a hydraulically actuated vacuum control valve, and a hydraulic slave cylinder, all incorporated into a single sealed unit.

1. DESCRIPTION

The vacuum check valve is of the spring loaded disc type and is installed in the system adjacent to the vacuum source for the purpose of maintaining maximum vacuum in the system. A properly functioning check valve will open only when source vacuum is higher than system vacuum, thus excluding gasoline vapor from the system.

NOTE: *The parts list for this equipment will appear in the next issue of the Stock Order Pad and Parts Book.*

The numbers appearing in the following paragraphs refer to corresponding numbers in figs. 2 and 3.

The power or booster chamber consists of two pressed steel sections (2 and 5) divided by a rubber diaphragm and metal pressure plate assembly (3), all of which are held together as an assembly by a metal clamp ring (4). The outer bead of the rubber diaphragm acts as a support for the diaphragm and also as a seal between the two sections of the booster chamber. The push rod (7) attached to the pressure plate extends through a support bushing (32) and seals (8 and 31) into the slave cylinder to actuate the slave cylinder piston (19) whenever the pressure plate moves forward because of a brake application.

The rear half (2) of the booster chamber is the control side and has a tractor-to-trailer outlet connection (⅜ in. pipe plug (34)). Also a tube and hose (1) connects this half of the chamber to the control valve. Air is admitted through the control valve (10 and 15) into the chamber rear half, applying atmospheric pressure to the back face of the diaphragm.

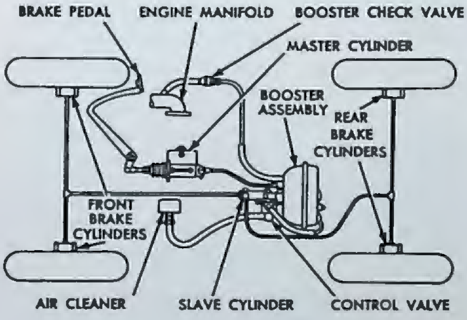


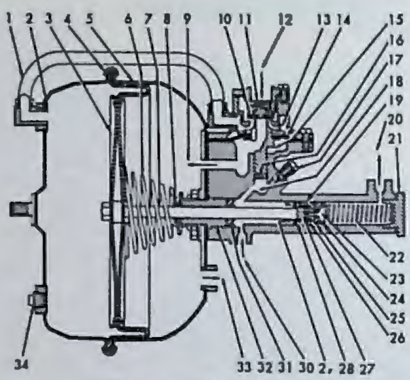
Fig. 1—Truck Brake Booster Diagram

The front half of the booster chamber (5) supports the slave cylinder and control valve, and has a hose connection (33) to the booster check valve and intake manifold by which air is exhausted from this half of the chamber, thus creating a vacuum. A diaphragm return spring (6) assists in brake release.

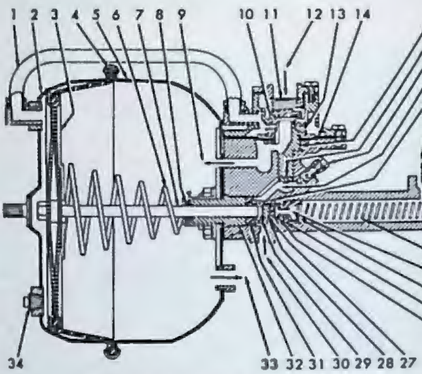
The control valve is mounted to and is an integral part of the slave cylinder and is composed of a control valve disc assembly (10), control valve disc spring (11), control valve diaphragm return spring (13), control valve diaphragm (14), control valve plunger and piston assembly (15), and seal (16). This valve is connected to the slave cylinder hydraulically by an internal passageway. Thus fluid entering from the master cylinder through the slave cylinder at (30) is directed to the control valve piston (15) and causes the piston diaphragm (14) and valve (10) to operate and control the admission of atmospheric pressure. The control valve atmospheric intake (12) is a hose connection which leads to the remote air cleaner located inside of the cab.

The slave cylinder is composed of a piston assembly (19), piston cup (25), check valve (27), check valve snap ring (29), check valve return spring (26), piston return spring (22), piston return spring retainer (24), cylinder end plug (21), and bleeder screw (17).

Through the slave cylinder fluid inlet passage (30), hydraulic brake fluid is permitted to enter the slave cylinder by passing through the small holes (28) in the side of the piston assembly and out through its end (23). This, however, only occurs for a short interval of the brake application or until the booster application begins. This permits physical foot pedal application in case of booster failure. If the piston does not operate in the short interval of time permitted, the by-pass will not close, then, with sufficient foot pedal pressure, the brake can be applied the same as if the booster unit had not been installed. The hydraulic fluid inlet from the master cylinder is at the rear end of the slave cylinder (30), and the outlet to the wheel cylinders is at the front end of the slave cylinder (20). A bleeder screw (17) is provided in the slave cylinder to permit bleeding of air from the hydraulic system.



BRAKE BOOSTER—APPLIED POSITION



BRAKE BOOSTER—RELEASED POSITION

1-BOOSTER CHAMBER TO CONTROL VALVE BY-PASS TUBE
2-BOOSTER CHAMBER BODY—REAR SECTION
3-DIAPHRAGM AND PRESSURE PLATE ASSEMBLY
4-BOOSTER CHAMBER BODY CLAMP RING ASSEMBLY
5-BOOSTER CHAMBER BODY—FRONT SECTION
6-DIAPHRAGM PRESSURE PLATE RETURN SPRING
7-DIAPHRAGM PRESSURE PLATE PUSH ROD
8-DIAPHRAGM PRESSURE PLATE PUSH ROD SEAL RETAINER—REAR
9-VACUUM PASSAGE TO CONTROL VALVE
10-CONTROL VALVE DISC ASSEMBLY
11-CONTROL VALVE DISC SPRING
12-ATMOSPHERIC PASSAGE FROM AIR CLEANER TO CONTROL VALVE
13-CONTROL VALVE DIAPHRAGM RETURN SPRING
14-CONTROL VALVE DIAPHRAGM
15-CONTROL VALVE PLUNGER AND PISTON ASSEMBLY
16-CONTROL VALVE PLUNGER AND PISTON SEAL
17-SLAVE CYLINDER BLEEDER SCREW
18-CONTROL VALVE PLUNGER HYDRAULIC FLUID PASSAGE
19-SLAVE CYLINDER PISTON ASSEMBLY
20-SLAVE CYLINDER FLUID OUTLET PASSAGE
21-SLAVE CYLINDER END PLUG
22-SLAVE CYLINDER PISTON RETURN SPRING
23-SLAVE CYLINDER PISTON AND CUP FLUID ORIFICE
24-SLAVE CYLINDER PISTON RETURN SPRING RETAINER
25-SLAVE CYLINDER PISTON CUP
26-SLAVE CYLINDER PISTON CHECK VALVE RETURN SPRING
27-SLAVE CYLINDER PISTON CHECK VALVE
28-SLAVE CYLINDER PISTON FLUID OPENINGS
29-SLAVE CYLINDER PISTON CHECK VALVE SNAP RING
30-SLAVE CYLINDER FLUID INLET PASSAGE
31-DIAPHRAGM PRESSURE PLATE PUSH ROD SEAL ASSEMBLY-FRONT
32-DIAPHRAGM PRESSURE PLATE PUSH ROD BUSHING
33-VACUUM PASSAGE FROM BOOSTER CHECK VALVE
34-BOOSTER CHAMBER BODY PIPE PLUG

B-212

Fig. 2—Brake Booster—Side Sectional Views

2. OPERATION

The following paragraphs describe the operation of the unit, both with the brakes released and applied.

a. Brakes Released.

A hose from the booster check valve connects the booster chamber (33) and control valve to the engine manifold vacuum. When the brakes are in the released position, there is vacuum on both sides of the diaphragm and pressure plate assembly which permits the return spring (6) to hold the diaphragm and pressure plate in the released position.

With the brakes in the released position, the vacuum passage is from the opening (33) which is the connection for the tube from the booster check valve —through the front section of the booster chamber (5) to opening (9)—through the hollow position of the control valve plunger (15) and the by-pass (1) to the rear section of the booster chamber.

A metal tube also connects the master cylinder to the slave cylinder opening (30) to provide a passage for the brake fluid to and from the master cylinder. With the brakes in the released position, the brake fluid is under a constant pressure of approximately 8 pounds per square inch which is controlled by the master cylinder return spring. This pressure is necessary to prevent leakage past the various piston cups and seals, and to assure that the brake shoes will be instantly responsive to the slightest pedal movement.

In order to maintain a proper equalization of this pressure throughout the entire brake system, an orifice (23) is provided through the slave cylinder piston and cup which is regulated by a spring controlled check valve (27) incorporated as a part of the slave cylinder piston.

b. Brakes Applied.

With the engine running, when the brake pedal is initially depressed for a brake application, fluid passes out of the master cylinder through a tube to the slave cylinder inlet passage (30)—the slave cylinder piston openings (28) to the control valve plunger and piston seal (15 and 16) also around the slave cylinder piston check valve (27) and through the piston and cup orifice (23) into the brake system. This displacement of fluid builds up the hydraulic line pressure, and when the fluid pressure reaches approximately 40 pounds per square inch, the contol valve plunger and piston (15) begins to move out, causing it to contact the rubber surface of the control valve disc (10) which seals the engine vacuum in the front section of the booster chamber. As the plunger continues to move, the control valve disc (10) is forced from its seat, admitting the atmosphere through the air cleaner and opening (12), which passes through the by-pass tube (1) and displaces the vacuum in the rear section of the booster chamber.

The atmospheric pressure, in the rear section of the booster chamber, forces the diaphragm and pressure plate assembly (3) forward, causing the push rod (7) to move into the slave cylinder piston and in

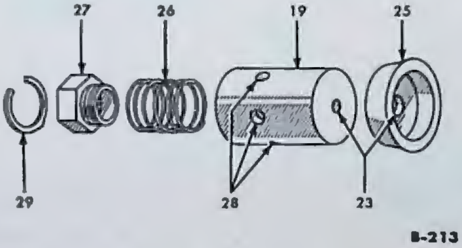


Fig. 3—Slave Cylinder Piston, Disassembled View

contact with the slave cylinder piston check valve (27) which seats the rubber surface of the check valve over the piston orifice (23), sealing the brake fluid in the slave cylinder and brake system.

As the atmospheric pressure forces the diaphragm and pressure plate assembly to move, the push rod moves the slave cylinder piston and cup forward in the cylinder to build up the hydraulic line pressure above that created by the master cylinder.

When the control valve plunger and piston assembly (15) has been fully opened, applying the entire output of the booster chamber, additional physical pressure can still be applied through the foot pedal and master cylinder without discomfort to the driver.

With this booster the operator is apprised of the amount of pressure being applied to the brakes through the pedal exactly the same as in a brake application on a truck without a booster. Although with this booster the required pedal pressure is proportionately less, braking power is in direct proportion to pedal travel and pedal pressure.

If, at any time, the power chamber fails to function when the brake pedal is depressed, the brake fluid will by-pass through the slave cylinder piston openings (28) and the piston and cup orifice (23), and permit the brakes to be applied by the master cylinder in the same manner as a truck that is not equipped with a booster. However, considerably more effort on the part of the driver will be required to stop the truck, and caution must be exercised if it becomes necessary to operate without the booster.

When the brake pedal is released, the control valve diaphragm return spring (13) returns the control valve plunger (15) to the released position, and allows the control valve disc (10) to seat and close the atmospheric opening. When this occurs, vacuum through the hollow section of the control valve plunger (15) displaces the atmosphere in the rear section of the booster chamber. This permits the return spring (6) to force the diaphragm and pressure plate assembly (3) back to the released position, and at the same time the slave cylinder piston and cup are forced back against the push rod front seal (31) by the return spring (22). And as the push rod moves out of contact with the slave cylinder piston check valve (27), the return spring (26) forces the check valve open and permits the master cylinder return spring to equalize the fluid and normal pressure in the brake system.

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July 27, 1947

3. MAINTENANCE AND REPAIR

a. Testing for Leakage.

The following tests and conclusions ((1) through (6)) may be used to determine whether the booster is operating correctly.

(1) Depress the brake pedal, applying full pressure, and while holding the pedal in this position, start the engine. The pedal should then move downward. If not, remove the pipe plug from the rear section of the booster chamber, and install a vacuum gauge. Start the engine and check the vacuum. If vacuum is from 18 to 21 inches, the difficulty can be considered to be in the booster unit.

(2) With the engine running and the brake pedal depressed, if the vacuum gauge fails to show a zero reading, the control valve is not functioning.

(3) If it is established that the control valve is functioning, again depress the brake pedal with sufficient pressure to show a zero reading on the vacuum gauge. Hold the pedal in this position for one minute. Any downward movement of the pedal during this time indicates a brake fluid leak out of the brake fluid system. Any upward movement of the pedal in this test indicates fluid leaking past the slave cylinder piston check valve (27).

(4) With engine running, depress the brake pedal with sufficient pressure to show a zero reading on the vacuum gauge. Shut off the engine and hold the pedal in this position for one minute. A kickback of the pedal indicates a vacuum leak which may be in the check valve, vacuum tube connections, or booster unit. Do not attempt to locate the leak until step (5) has been completed.

(5) Start the engine to create vacuum in the system, but do not depress the brake pedal. Then stop the engine and observe the vacuum gauge—the drop in vacuum should not be more than one inch per minute.

(6) *RESUME.* Leakage in test (4) but not in test (5) indicates that the booster unit is at fault.

Leakage in both test (4) and (5) may be located in

(a) The check valve on the dash
(b) Vacuum tube connections
(c) Booster unit

b. Disassembly.

Remove the large nut (21) at the end of the slave cylinder, and remove the piston spring or springs (22) and retainer (24).

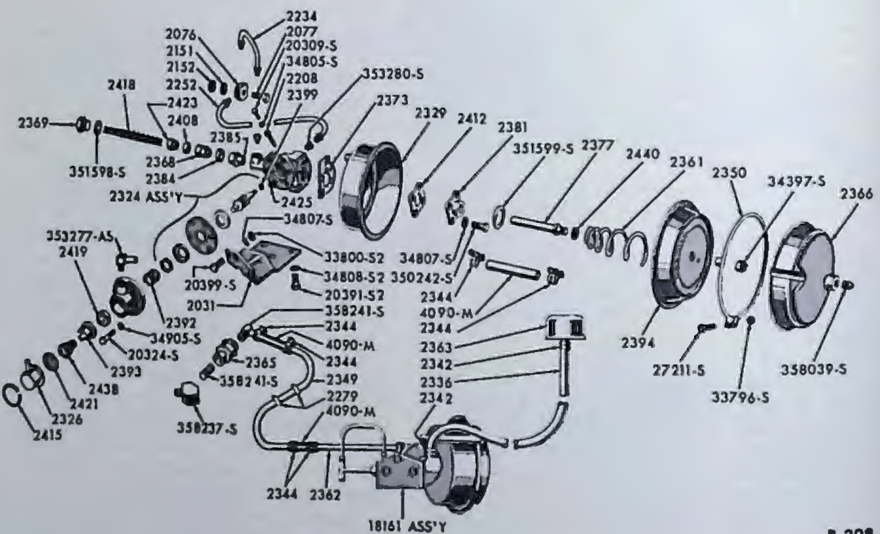

Fig. 4—Truck Booster Brake, Disassembled

July 27, 1947

Scratch marks on both sections of the booster chamber (marks opposite each other) so that they can be assembled in their original positions.

Punch marks on the flanges of the control valve and slave cylinder (marks opposite each other) so that they can be assembled in their original positions.

Remove the control valve to vacuum chamber tube (1).

Remove the clamp ring (4), the rear section of the booster chamber (2), and the diaphragm and pressure plate assembly (3) with the return spring (6).

Remove the five screws which fasten the front section of the booster chamber to the slave cylinder. Remove the seal retainer (8), front section of the booster chamber (5), and push rod bushing (32).

Remove the three screws holding the valve cover to the control valve, and remove the cover. Lift out the valve disc spring (11) and valve disc (10).

Remove the six bolts and screws from the control valve body. Lift the control valve body, diaphragm return spring (13), and the control valve plunger and diaphragm assembly (14 and 15) from the slave cylinder body.

Remove the push rod seal (31) from the rear end of the slave cylinder.

With the booster chamber diaphragm push rod, push the slave cylinder piston and rubber piston cup out the front end of the slave cylinder.

c. Inspection.

Wash all metal parts in dry-cleaning fluid. Wipe thoroughly with clean rags, and use compressed air to dry all internal passages.

Replace all worn or damaged parts. If, upon examination, there is any evidence of wear or corrosion in the control valve plunger or slave cylinder bores, it is recommended that the slave cylinder body be replaced.

Always replace the control valve diaphragm, all rubber cups, seals, and springs. If the seat in the control valve is damaged, replace the control valve body.

The slave cylinder piston assembly should be thoroughly cleaned to insure proper application and release of the check valve. It should not be necessary to replace this assembly except in a "Major overhaul" unless a definite hydraulic leak was evident before disassembly. If leakage in the slave cylinder does occur, replace the piston assembly, rubber cup, seal, control valve plunger, and piston seal.

d. Assembly.

Assemble in reverse order, and install the front seal assembly (31) in the slave cylinder body before the push rod bushing (32) and front section of the booster chamber (5) are assembled to the slave cylinder body. It is essential that the booster chamber, as well as the control valve and slave cylinder, be assembled according to the scratch and punch marks made during disassembly.

When assembling the control valve diaphragm, washers, and nut to the plunger and piston assembly, apply a small amount of shellac to the threads to prevent leakage.

The control valve diaphragm, as well as the booster chamber diaphragm, can be installed in any position.

Apply hydraulic brake fluid to all slave cylinder internal parts and cylinder bore before assembling.

e. Bleeding of Brake System.

The only exception to the standard bleeding procedure that need be observed on vehicles equipped with this booster is to bleed the booster slave cylinder first, and then the wheel cylinders can be bled in the usual manner.

It is good Service to advise an owner that he requires work that he actually does require, and this work should be sold to him, for the acquainting of the owner with his requirements becomes but an idle gesture if the effect ends there.

July 27, 1947

Operation 2780-A
Hand Brake Adjustment

The following hand-brake adjustment procedures apply to all Ford, Mercury, and Lincoln cars, and all Ford trucks and Commercial cars from 1932 through 1947. These procedures are to be included in any major brake adjustment (Opr. 2000-B).

1. PROCEDURES.

Due to differences in the designs, several different hand-brake adjustment procedures are required. The procedure to be followed is controlled by the vehicle type or year, or both. Select the procedure that suits the particular vehicle being worked on (pars. a through f below).

a. 1937-1938 Ford Cars.

Adjust the hand-brake cable length so that the hand-brake lever has from ¼ inch to ½ inch free movement at the end of the lever. Care should be taken that the hand-brake cable is not adjusted too short, otherwise the cross shaft position will be changed and the brake cables will hold the brake shoes off the anchor pin.

b. 1932-1939 Ford Trucks, Except 1939 One-Ton Truck.

Adjustment is accomplished by shortening or lengthening the hand-brake cross shaft to wheel rods as required.

c. 1936-1938 Lincoln.

Adjust the dash end of the hand-brake cable conduit either forward or rearward, as required, by means of the two nuts provided. The hand-brake lever should have ¼ inch to ½ inch free movement at the end of the brake lever. To decrease the free movement in the hand-brake lever, adjust the conduit rearward. To increase the free movement, adjust the conduit forward.

d. 1939-1947 Ford, Mercury, and Lincoln Cars and 1939 One-Ton Truck.

Release the hand-brake lever. Using a pedal jack, apply just sufficient pressure to the brake pedal to apply the rear brake shoes firmly against the drums.

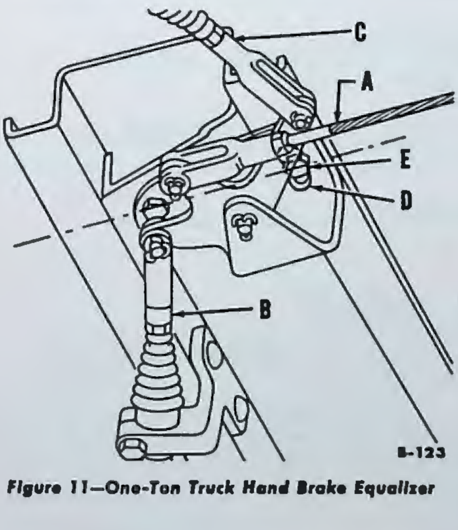

Figure 11—One-Ton Truck Hand Brake Equalizer

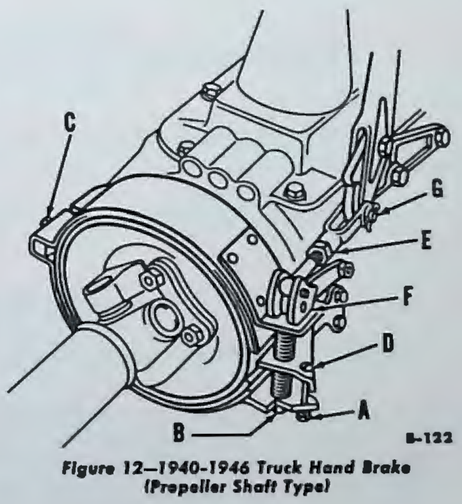

Figure 12—1940-1946 Truck Hand Brake (Propeller Shaft Type)

Pull up all slack in the hand-brake lever pedal, and adjust the cable so that with the foot brake applied as outlined above, ½ inch free movement is present at the end of the brake lever.

e. 1940-1947 One-Ton Truck.

Release the hand-brake lever, using a pedal jack, apply just sufficient pressure to the brake pedal to apply the rear brake shoes firmly against the drums. Adjust wheel cables "B" and "C" to remove excess slack (fig. 11). Cables should be adjusted so that when the hand brake is applied the bolt "E" is in the center of the slot "D." Adjust the hand lever to equalizer cable "A" so that with the foot brake applied as outlined above ½ inch movement is present at the end of the brake lever.

f. 1940-1947 Trucks, Except One-Ton.

Release the hand-brake lever. See that the flat portion of the cam "F" is resting on the ear of the band as shown in figure 12. If not, remove the pin "G" so that it will work. Remove the anchor locking wire and turn the anchor adjusting screw "C" until a clearance of 0.010 inch is established between the brake band and drum. Replace the locking wire. Loosen the lock nut "A" and adjust the screw "D" to establish 0.010 inch clearance for lower half of shoe. Retighten the lock nut. Tighten the adjusting nut "B" until a clearance of 0.010 inch is likewise established for the upper half of the brake band. Adjust rod "E" so that it is exactly the right length with hand-brake lever in the fully released position and the flat of the cam is resting on the ear of the brake band (see "F").

Brake service is one of the most frequently required services, and provides one of the best means of building a reputation for good service.

May 17, 1947

Symptom 2999-A

Hydraulic Brakes Tighten During Operation

NOTE: *If the brakes are locked, preventing movement of the car, remove the wheel cylinder valve dust screw and open the valve momentarily. A few drops of fluid will come out, relieving the pressure, thus freeing the brakes. This is merely a temporary expedient and does not correct the cause of the trouble.*

Adjust the brake pedal rod to obtain ¼-inch free movement of the brake pedal, measured at the pedal pad, if required. If adjustment of the brake pedal rod was not required, or if it does not correct the trouble, replace the master cylinder piston rubber cup.

Symptom 2999-B

Spongy Hydraulic Brake Pedal

Bleed the hydraulic system to eliminate air that has entered into the system.

A normal brake pedal travels only to a point where the desired hydraulic pressure is developed. A spongy pedal will not develop hydraulic pressure and will travel until it reaches the floor board.

Air will enter the hydraulic system if the fluid in the master cylinder is too low, excessive clearance exists between the brake linings and the drums, or if the pistons of the wheel cylinders are not held firmly in place when the tension of the brake shoe retracting springs is removed while servicing the brakes.

Symptom 2999-C

Low Pedal Reserve

During normal operation a little of the brake lining wears away each time the brakes are applied. This wear is compensated for and the brakes are restored to normal by means of a minor brake adjustment (Opr. 2000-A).

Symptom 2999-D

Uneven, Noisy, or Grabbing Brakes or Hard Pedal

Uneven, noisy, or severe brake action or an excessively hard brake pedal can be caused by a combination of conditions, all of which require the removal of the drums to locate. Where these troubles exist, nothing is to be gained by attempting to name the cause before the drums are removed and an inspection is possible. A major brake adjustment (Opr. 2000-B) with the recommended repairs or replacements will correct any of these troubles.

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June 7, 1947

Every car and truck on the road needs at least one brake adjustment every year.

Merely by checking the brake pedal reserve of cars that come into your shop you can get your share of this work.

3000, 3002, AND 3010—FRONT WHEEL ALIGNMENT

Part Number	Caster Degrees		Camber Degrees		Side Inclination Plus Camber Degrees		Toe-in Front Wheels (Inches)	Tread (Inches)	Distance Between Center of Spindle Arm and Brake Plate	
	Max.	Min.	Max.	Min.	Max.	Min.			R. Side (Inches)	L. Side (Inches)
B-3010	9	4½	1	¼	9	8¼	3/32	55.75		
BB-3010	5	3	1	¼	9	8¼	3/32	57.00		
51-3010	5	3	1	¼	9	8¼	0	57.00		
70-3010	5	3	1	¼	9	8¼	0	58.3		
70-3010-B	5	3	1	¼	9	8¼	0	58.3		
78-3010-A	9	4½	1	¼	9	8¼	1/16	55.75		
81T-3010-A	5	3	1	¼	9	8¼	0	57.00		
81W-3010	3½	1	1	¼	9	8¼	1/16	56.66		
01T-3010	3½	1	1	¼	8	7¼	1/16	58.7		
01Y-3010	3½	1	1	¼	8	7¼	1/16	55.7		
19B-3010-A	3½	1	1	¼	8	7¼	1/16	56.66		
19B-3010-B	3½	1	1	¼	8	7¼	1/16	56.66		
21A-3010	9	4½	1	¼	9	8¼	1/16	58.00	11/16	11/16
21Y-3010	3½	1	1	¼	8	7¼	1/16	58.00	11/16	11/16
96H-3010	5	3	¾	¼	5½	4	1/16	55.5	1 3/16	1 3/16
26H-3010	5	3	¾	¼	5½	4	1/16	59.00	1 5/16	1 5/16
7EQ-3010	3½	1	1	¼	8	7½	1/16	66.07		
								65.30		
7RC-3010	3½	1	1	¼	8	7½	1/16	58.08		
7RT-3010	3½	1	1	¼	8	7½	1/16	60.03		
								58.51		
7RW-3010-B	3½	1	1	¼	.8	7½	1/16	63.43		
8A-3002-B	+¼	−¾	−¼	+¾	5		1/16–1/8	56.00		
SK-8M-3000	+½	−½	+¾	0	5		3/32–5/32	58.50		

3109-10—KING PIN BUSHING

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)	Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)
BB-3109	1.005 –1.006	1.011	11A-3110-A2	0.8130–0.8135	0.8185
70-3109-A	1.355 –1.357	1.362	HB-3110	0.9380–0.9385	0.9435
70-3109-B	1.355 –1.357	1.362	21A-3110	0.8125–0.8135	0.8185
81T-3109-A2	1.130 –1.1305	1.1355	51A-3110-A1	0.8715–0.8735	0.8785
81T-3109-A1	1.130 –1.1305	1.1355	51A-3110-A2	0.8715–0.8735	0.8785
09B-3109	1.231 –1.233	1.238	8A-3110-A	0.8125–0.8135	0.8185
19B-3109-A1	1.2345–1.2355	1.2405	8H-3110	0.9380–0.9385	0.9435
11A-3110-A1	0.8130–0.8135	0.8185			

3115-16—KING PIN

Part Number	Mfg. Maximum Diameter (Inches)	Wear Limit Diameter (Inches)	Mfg. Clearance in Bushing (Inches)	Wear Limit Clearance in Bushing (Inches)
B-3115	0.8115–0.8125	0.8175	0.0005–0.0020	0.009
BB-3115	1.003 –1.004	1.009	0.001 –0.003	0.010
48-3115	0.8115–0.8125	0.8175	0.0005–0.0020	0.009
51-3115	0.8115–0.8125	0.8175	0.0005–0.0020	0.009
81T-3115	1.128 –1.129	1.134	0.001 –0.0035	0.010
16H-3115	0.9365–0.9375	0.9425	0.0015–0.0020	0.009
92Y-3115	0.9365–0.9375	0.9425	0.0015–0.0020	0.009
21A-3115	0.8115–0.8125	0.8175	0.0005–0.0020	0.009
70-3116-A	1.3585–1.3595	1.3645	0.001 –0.002	0.009
70-3116-B	1.3585–1.3595	1.3645	0.001 –0.002	0.009
09B-3116	1.2335–1.2345	1.2385	0.0005–0.0035	0.0105
19B-3116	1.2335–1.2345	1.2385	0.0005–0.0035	0.0105
8A-3115	0.8115–8.0120	0.8170	0.0005–0.002	0.009
8M-3115	0.9365–0.9370	0.942	0.001 –0.002	0.009

June 9, 1948

3524—STEERING GEAR

The worm and roller (or sector) determines the characteristics of the steering gear, and for this reason the following steering gear specifications are keyed to the worm and roller (or sector). When in doubt as to the car or truck model consult the parts book.

Worm and Shaft Part Number	Roller or Sector and Shaft Part Number	Type	Maximum Worm End Play (Inches)	Maximum Free Play at Steering Wheel Rim Straight Ahead Position (Inches)	Maximum Pull at Steering Wheel Rim Straight Ahead Position Drag Link Disconnected (Pounds)
A-3524-B	A-3575-B	W S	0.000–0.003	1.5	3
A-3524-C	A-3575-C	W S	0.000–0.003	1.5	3
A-3524-D	A-3575-C	W S	0.000–0.003	1.5	3
B-3524-A	B-3575-A	W S	0.000–0.003	1.5	3
B-3524-B	B-3575-B	W S	0.000–0.003	1.5	3
BB-3524	BB-3575	W S	0.000–0.003	1.5	3
40-3524-A	B-3575-B	W S	0.000–0.003	1.5	3
40-3524-C	B-3575-B	W S	0.000–0.003	1.5	3
48-3524	48-3575	W S	0.000–0.003	1.5	3
50-3524	48-3575	W S	0.000–0.003	1.5	3
51-3524	51-3575	W S	0.000–0.003	1.5	3
67-3524	68-3575	W S	0.000–0.003	1.5	3
68-3524	68-3575	W S	0.000–0.003	1.5	3
H-3524-A	H-3575	W R	0.000–0.003	1.5	3
H-3524-B	H-3575	W R	0.000–0.003	1.5	3
77-3524	78-3575	W R	0.000–0.003	1.5	3
78-3524	78-3575	W R	0.000–0.003	1.5	3
HB-3524-A	HB-3575-A	W R	0.000–0.003	1.5	3
HB-3524-B	HB-3575-B	W R	0.000–0.003	1.5	3
70-3524-B	70-3575	W S	0.000–0.003	1.5	3
81A-3524	78-3575	W R	0.000–0.003	1.5	3
81C-3524	78-3575	W R	0.000–0.003	1.5	3
81T-3524	81T-3575	W S	0.000–0.003	1.5	3
81W-3524	81W-3575	W S	0.000–0.003	1.5	3
82Y-3524	78-3575	W R	0.000–0.003	1.5	3
86H-3524	HB-3575-B	W R	0.000–0.003	1.5	3
99A-3524	78-3575	W R	0.000–0.003	1.5	3
01A-3524	78-3575	W R	0.000–0.003	1.5	3
01T-3524	01T-3575	W S	0.000–0.003	1.5	3
09A-3524	78-3575	W R	0.000–0.003	1.5	3
06H-3524-A	HB-3575-B	W R	0.000–0.003	1.5	3
06H-3524-B	HB-3575-B	W R	0.000–0.003	1.5	3
06H-3524-C	HB-3575-B	W R	0.000–0.003	1.5	3
11A-3524	78-3575	W R	0.000–0.003	1.5	3
19A-3524-A	78-3575	W R	0.000–0.003	1.5	3
19A-3524-B	78-3575	W R	0.000–0.003	1.5	3
16H-3524	HB-3575-B	W R	0.000–0.003	1.5	3
26H-3524-A	HB-3575-B	W R	0.000–0.003	1.5	3
26H-3524-B	HB-3575-B	W R	0.000–0.003	1.5	3
8A-3524	8A-3575	W R	0.000–0.003	1.5	3
8M-3524	8M-3575	W R	0.000–0.003	1.5	3

W S—Indicates worm and sector.
W R—Indicates worm and roller.

Remember, the cleanliness of your service department reflects the type of service you render.

Operation 3000-B

Check Wheel Alignment and Steering Control

Since all of the factors of wheel alignment are established from either a true horizontal or true vertical plane, the vehicle must be reasonably level when measurements of the factors of wheel alignment are made. If the floor is not exactly level, the error will be as follows:

(1) *ONE FRONT WHEEL LOWER THAN THE OTHER.* When one front wheel is lower than the other, the error will amount to approximately one degree per inch (based on 58 inch tread width). Thus, ⅛ inch error would result in an error of ⅛ degree in both camber readings and side inclination of the spindle pin readings. Since tolerances are never set at less than ¼ degree, a lack of level of ⅛ inch (⅛ degree) or less is not a serious factor.

(2) *REAR WHEELS LOWER OR HIGHER THAN FRONT WHEELS.* When the rear wheels are not level with the front wheels, the error in caster readings will amount to approximately ½ degree per inch (based on 116 inch wheelbase). Thus, ½ inch error in the floor would result in a ¼ degree error in the caster reading. Errors in the reading of ¼ degree or less are not a serious factor in diagnosing caster. If the rear wheels are higher than the front wheels, the reading would be less than it should be. If the rear wheels are lower than the front wheels, the reading would be more than it should be.

Large wheel alignment machines with runways merely level the car and have the disadvantage of restricting wheel alignment diagnosis to the one location. Thus, if one car is on the machine, no additional cars can be checked until the one being worked on is finished. This may result in the dealership being out of the wheel alignment business for several hours.

Wheel alignment racks are constantly being bumped or backed into, throwing them out of alignment. Some of these racks can be thrown out of alignment by a firm application of the brakes as the car is being positioned. The approaches to the rack usually block the aisles and present a shop traffic problem.

With approved portable equipment, the actual checking of wheel alignment requires only a few minutes, and the equipment can be taken to any part of the shop to check other cars that may come in for diagnosis. Since no movement of cars is involved, no traffic problems result. All of the equipment involved is light in weight and can be held in one hand.

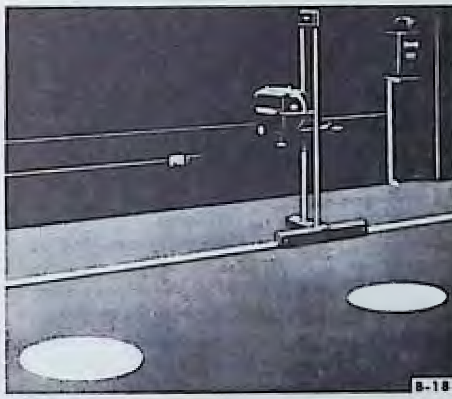

Fig. 1—Marks Indicating Level Areas

No turntables are required (nor desirable) with this equipment. Taking advantage of the fact that when the chord of a given radius and angle is duplicated, the angle is duplicated, a turn indicator employing this principle is used to establish the 20-degree turns for measuring caster and side inclination.

Where the floor in the diagnosis and quick-service section of the shop is in bad condition, it usually costs less to repair the floor than to buy a large aligner with runways.

Where the floor is reasonably level, it is a good plan to paint white spots on the floor to indicate locations that are level enough to check wheel or headlight alignment. A suggested set of floor marks are shown in fig. 1. Any number of such marks can be located throughout the shop. With such markings all of your mechanics will know that as long as the front wheels are on these spots, wheel alignment may be checked without moving the car or worrying about its being level.

With the perfection of this portable equipment, an investment of less than $70.00 in equipment puts even the smallest shop in a position to successfully compete for the very profitable wheel alignment business, at the same time providing a needed service to owners. Tests under laboratory conditions reveal that this portable equipment is equal in accuracy to even the most elaborate machine.

With front axles having a list price of less than $10.00 for most models, there is little reason for any dealer purchasing axle bending tools.

1. PROCEDURE.

The wheel alignment specifications are omitted in the following procedures since they are given in the Specification Bulletin at the front of this section. Throughout these procedures, extra operations are in *italics.*

(1) Inflate the tires to recommended pressure.

(2) While driving the car in the straight ahead position, place a pencil mark on the steering wheel hub and steering column tube (fig. 2) to establish the straight ahead position on the steering gear for later reference during the checking procedure.

NOTE: *Throughout the following procedures (subpar. c through i), when the wheels are lowered to the floor, make sure the full weight of the car or truck is on the wheels and not partially on the jack.*

a. Check Looseness.

(1) Raise the front wheels off the floor. Grasp the wheels at each side, and push in and pull out. If any free play is noticed, *adjust the wheel bearings.*

Fig. 2—Steering Wheel Alignment Marks

(2) With the front wheels off the floor, grasp the wheels at the top and bottom (fig. 3) and shake them, observing the movement of the brake plates. If the brake plates have more than $\frac{1}{32}$ inch movement, *rebush the spindles.*

(3) Grasp the front of the front wheels (fig. 4), push them away from each other, and then pull them toward each other, observing the tie rod and drag link ends for looseness. *Replace loose tie rod and drag link ends.*

(4) Check the steering gear mounting bolts, and tighten them if required.

(5) Tighten the spring U bolts. Check the spring center bolt, *and tighten or replace it,* whichever is required.

(6) Check the front radius rod ball joint for looseness, and tighten or *replace the ball joint rubber,* whichever is required.

b. Check Wheel Balance.

(1) Raise the front wheels off the floor. Spin the wheels and observe the run-out at the top of the wheel. If the run-out is in excess of $\frac{3}{8}$ inch, it may be advisable to *install the wheel on the rear axle.*

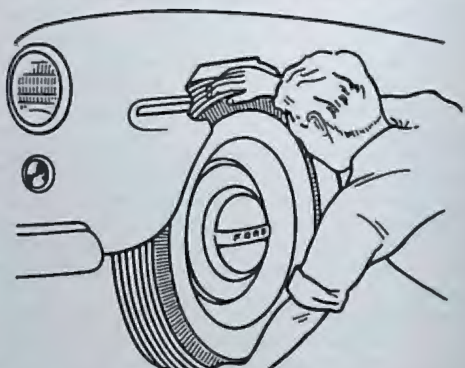

Fig. 3—Checking Spindle Bushings

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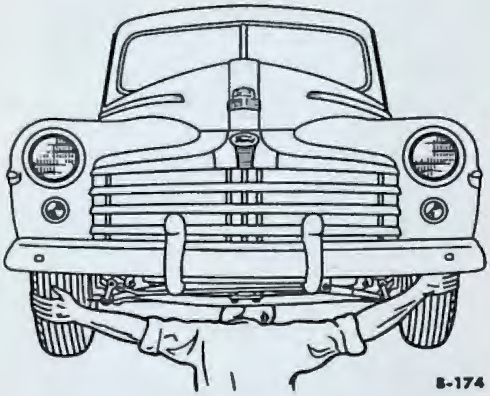

Fig. 4—Checking Tie Rod and Drag Link Ends

(2) Using a wheel spinner (fig. 5), spin each wheel in turn. A wheel that is out-of-balance will cause the front of the car to shake. *Balance the wheels if required.*

c. Check Camber.

Position the car or truck in the working stall with the front wheels in the center of the white level spots on the floor.

Fig. 5—Checking Wheel Balance with Wheel Spinner

Fig. 6—Checking Parallel Plane of Wheel

(1) *INSTALL GAUGE HOLDER.* Adjust the gauge holder set screws to insure a firm grip on the rim. Adjust the gauge holder rod to the approximate center of the wheel, and tighten the rod set screws. Place the gauge holder on the wheel with the three set screws held firmly against the outer edge of the rim, and turn the clamping handle ¾ turn clockwise to secure the holder in place (fig. 6).

CAUTION: Make sure that all three contact points are seated firmly against the rim.

(2) *ESTABLISH THE PARALLEL PLANE OF WHEEL.* Raise the front wheels off the floor. Install the gauge on the gauge holder spindle with the "+" side of the camber scale toward the wheel (fig. 6).

Rotate the wheel slowly, and observe the range of movement of the pointer on the scale. This will indicate the amount of wheel wobble or run-out. If the wheel wobble or run-out is in excess of ⅛ inch, *replace the wheel, or install it on the rear.* If the run-out is not excessive, stop the wheel at the point where the pointer is in the exact center of the total pointer movement.

Place a pedal jack on the brake pedal, adjust it to firmly apply the brakes, or turn one brake cam adjustment tight to hold the wheel in this position.

CAUTION: Make sure the gauge holder rods will clear the floor before lowering the wheels.

Turn the wheels to the straight ahead position by

Fig. 7—Checking Camber

aligning the pencil marks on the steering wheel hub and steering column tube (fig. 2). Lower the weight of the car on the front wheels, and read and record the camber on the camber scale (fig. 7). Repeat the operation on the other wheel. If the camber is incorrect, check the king pin side inclination. If the camber angle is within the limits shown in the specifications (Subject 3000), omit the king pin inclination procedure.

d. Check King Pin Inclination.

Raise the wheels clear of the floor, and turn the wheels in the straight ahead position. Lower the wheels.

Remove and reinstall the gauge on the gauge holder spindle, using the hole through the gauge at right angles to the caster and camber checking position (fig. 8).

Install the turn indicator on the gauge holder spindle. Set the indicator so the chain will be in line with numeral 5 when working on passenger cars and light duty trucks, or the numeral 3 when working on heavy duty trucks. Tighten the thumb screws to hold it in the desired position. Place the wheels in the straight ahead position. Adjust the chains in the turn indicator slots so the plumb bobs just clear the floor. Draw two short lines on the floor in line with the plumb bobs at right angles to the wheel.

Move the gauge assembly until the pointer is in alignment with the zero (0) on the camber scale, and tighten the thumb screw to secure the gauge at this position (fig. 8).

Raise the front wheels to clear the floor. Adjust the plumb bobs to just clear the floor.

Turn the wheels until the front plumb bob is in alignment with the rear mark on the floor (fig. 9). Lower the wheels. Adjust the zero (0) on the caster scale in line with the pointer.

Fig. 8—Wheel in Straight Ahead Position, Checking King Pin Inclination

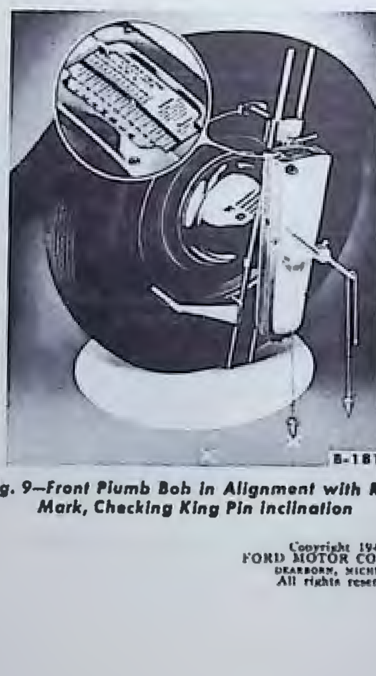

Fig. 9—Front Plumb Bob in Alignment with Rear Mark, Checking King Pin Inclination

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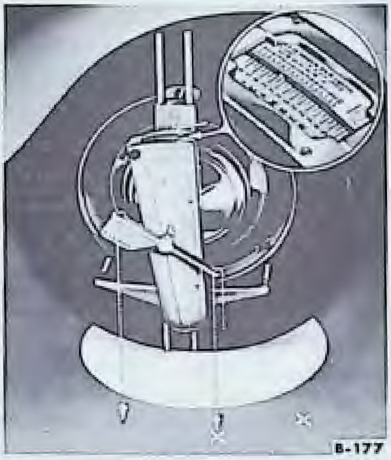


Fig. 10—Rear Plumb Bob in Alignment with Front Mark, Checking King Pin Inclination

Raise the wheels to clear the floor. Turn the wheels until the rear plumb bob is in alignment with the front mark on the floor (fig. 10). Lower the wheels, read the caster scale and multiply the reading by 0.9 ($\frac{9}{10}$) to obtain the king pin angle. Record the readings.

EXAMPLE: *If caster scale reading is 9 degrees when multiplied by 0.9, king pin angle reading would be 8.1 degrees.*

If the camber plus king pin side inclination is not within the limits shown in the specifications, the spindle is at fault. If the king pin side inclination plus camber is within the limits shown in the specifications, the fault is in the axle "I" beam.

e. Check Caster.

Install the gauge on the gauge holder spindle, using the same hole as used for checking camber.

Install the turn indicator setting it so the chain will be in line with the numeral 5 when working on passenger cars and light duty trucks, or the numeral 3 when working on heavy duty trucks. Tighten the thumb screw to hold it in the desired position (fig. 11).

Place the wheels in the straight ahead position by aligning the pencil mark on the steering wheel hub and steering column tube (fig. 2). Raise the front wheels clear of the floor.

Turn the wheels until the front plumb bob is in line with the rear mark on the floor (fig. 12). Lower the wheels, and turn the wheels to correct any misalignment of the plumb bob with the floor mark. Turn the knob on the gauge until the zero (0) on the caster scale is in line with the pointer. Raise the wheels clear of the floor, and turn them until the

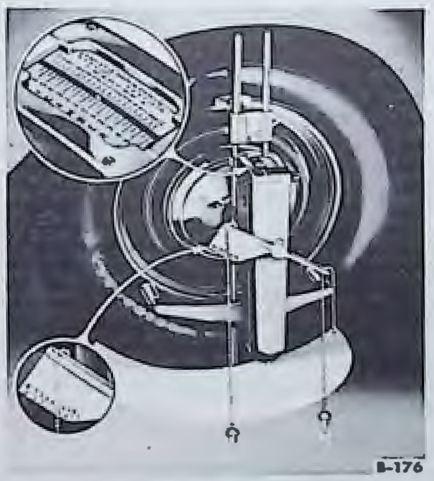


Fig. 11—Wheel in Straight Ahead Position, Checking Caster

Fig. 12—Front Plumb Bob in Alignment with Rear Mark, Checking Camber

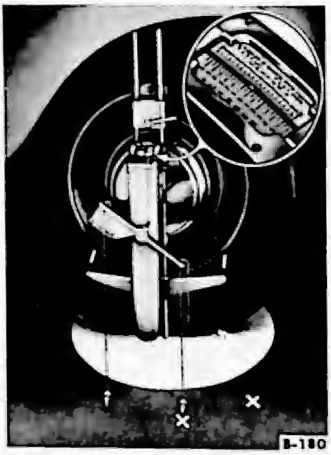


Fig. 13—Rear Plumb Bob in Alignment with Front Mark, Checking Caster

rear plumb bob is in line with the front mark on the floor (fig. 13). Lower the wheels, and correct any misalignment with the mark on the floor. Read and record the caster angle. If the caster is not within the limits shown in the specifications (Subject 3000), adjust the caster or install front axle "I" beam, or radius rod, whichever is required. (After changing caster always recheck the camber angle, and *adjust the camber if required.)*

Remove the pedal jack or release the brake adjustment whichever applies.

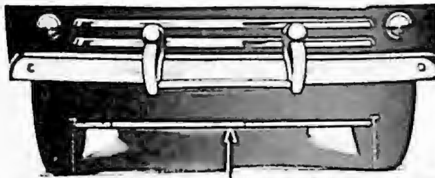
f. Adjust Shock Absorbers and Drag Link.

(1) Check the shock absorbers for leakage and the condition of the links. *Tighten the shock absorbers or replace the links, whichever is required.*

(2) Align the pencil marks on the steering wheel and steering column (fig. 2). If two spoke type steering wheel spokes are not now in a horizontal position, *adjust the drag link.*

g. Check Toe-In.

Push the car backwards approximately six feet, and then pull the car forward about three feet. Place a telescope type toe-in gauge between the wheels at the front with the ends of the gauge bearing against the side walls of the tires and both pendent chain ends just touching the floor (fig. 14). Set the scale so the pointer registers zero (0). Pull the car for-



TELESCOPE TYPE TOE IN GAUGE B-185

Fig. 14—Checking Toe-In

ward until the gauge is brought into position to the rear of the front axle with both pendent chains just touching the floor. Read the scale, the pointer will register the toe-in. If the toe-in is incorrect, *adjust the toe-in* to the required specifications.

h. Check Rear Wheel Alignment.

(1) If the rear tires show excessive wear, check the rear wheels for toe-in and camber in the same manner as for checking toe-in and camber of the front wheels. If the rear wheels have a toe-in or camber reading, this usually indicates a distorted axle or bent radius rods. *Repair or replace the parts,* whichever is required.

(2) Place the front wheels in the straight ahead position. Measure the distance between the center of the rear axle shaft and the center of the front wheel spindle. Check the other side and compare the readings. If the readings on the two sides are equal, it usually is safe to assume that the relationship of the rear axle to the center line of the frame is satisfactory. If unequal readings are obtained on the two sides, the end of either the rear. axle or the front axle has moved forward or backward, or the axle housing is bent. The readings obtained are the wheelbase of the car or truck, and, even when equal readings are obtained, they should be within 3/8 inch of specifications. *Extra charge for correction.*

i. Check Toe-Out on Turns.

Toe-out on turns is controlled by spindle arm angle. Measure the distance between the spindle arm and the brake plate. See specifications for the correct measurement. If the specification for the car or truck being worked on is not listed, the measurement can be obtained by measuring another car or truck of the same model. If the toe-out on turns is incorrect, *replace* or *bend the spindle arm to obtain the correct angle.*

j. Check Brakes.

Check the brakes for eveness and *adjust the brakes* if required.

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RIDE STABILIZERS

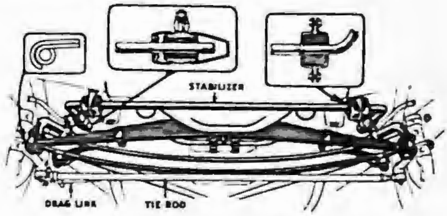
FORD

Fig. 1 illustrates the torsion stabilizer that was adopted starting with 1940 85 H. P. cars.

This particular stabilizer was later discontinued for both production and service, being replaced by the design shown in Fig. 2.

This stabilizer by virtue of the flanges at the insulation on the frame (as shown in the insert in Fig. 2), **prevents side movement** of the front of the frame with regard to the axle.

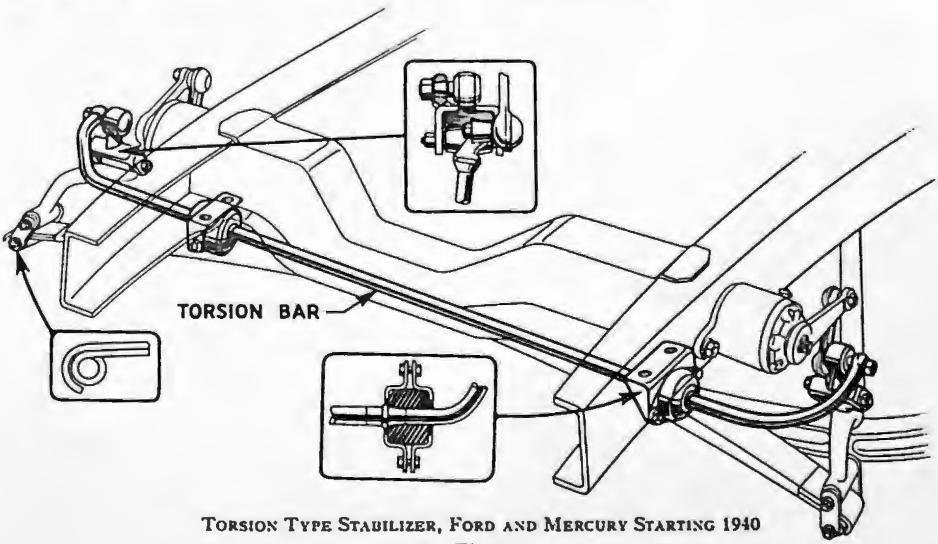
In addition to preventing side movement this stabilizer **prevents "body roll"** since it would be necessary to twist the bar before the front of the car could be thrown out of parallel with the axle.



Obsolete Stabilizer Early 1940
Ford V-8 and Mercury

Fig. 1

These stabilizers improve riding comfort and steering control, particularly when roads are rough or winding

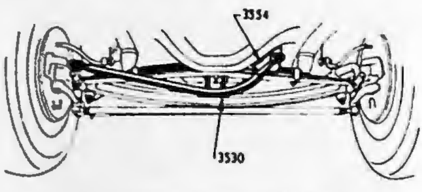


Torsion Type Stabilizer, Ford and Mercury Starting 1940

Fig. 2

ABOVE APPLIES TO MODELS:
LINCOLN-ZEPHYR STARTING 1936
MERCURY STARTING 1939
FORD STARTING 1940
LINCOLN STARTING 1941

June 6, 1941



MERCURY STRUT ROD, 1939 ONLY

Fig. 3

MERCURY

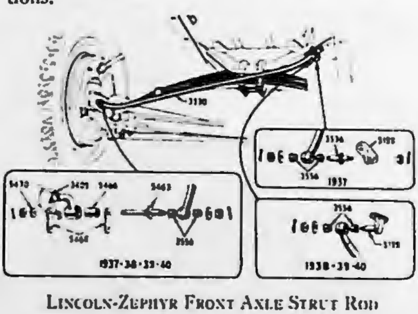
Figure 3 illustrates the strut rod adopted during 1939 on Mercury cars.

Starting with 1940 models the Mercury cars used the same stabilizers as were adopted for the Ford cars at that time (see Figs. 1 and 2).

LINCOLN-ZEPHYR

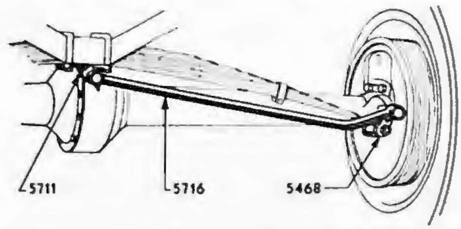
During 1936 a strut rod was adopted on the Lincoln-Zephyr cars to restrict sidewise movement of front end of the frame which otherwise would be transmitted to the drag link and spindle, permitting cross winds to affect the control of the car.

Since that time several improvements have been made as shown by the following illustrations.



LINCOLN-ZEPHYR FRONT AXLE STRUT ROD

Fig. 4



LINCOLN-ZEPHYR REAR AXLE STRUT ROD, 1937 ONLY

Fig. 5

Figure 4 shows the strut rod referred to above and continued since 1936 including 1940 Lincoln-Zephyr cars.

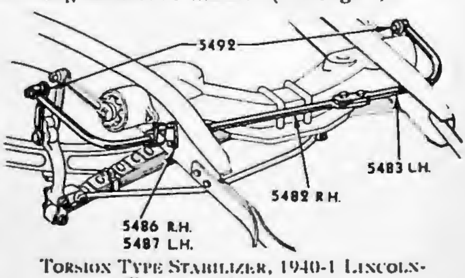
Figure 5 shows the strut rod used on the rear axle on 1937 Lincoln-Zephyrs only.

Starting with **1940** models the **Lincoln-Zephyr** cars while still retaining the front strut rod shown in Fig. 4, have **added** a **"torsion"** type **stabilizer** that prevents body roll in the same manner as the stabilizer adopted for 1940 Ford and Mercury cars.

This stabilizer is **shown in Fig. 6.** It will be noted that the Lincoln-Zephyr stabilizer does not prevent side movement as is true of the Ford and Mercury stabilizer shown in Fig. 2. On these cars sidewise movement is prevented by the strut rod (see Fig. 6).

LINCOLN

The same stabilizer as is used on the Lincoln-Zephyr was adopted for Lincoln custom cars starting with 1941 models (see Fig. 6).



TORSION TYPE STABILIZER, 1940-1 LINCOLN-ZEPHYR, 1941 LINCOLN

Fig. 6

ABOVE APPLIES TO MODELS:
LINCOLN-ZEPHYR STARTING 1936
MERCURY STARTING 1939
FORD STARTING 1940
LINCOLN STARTING 1941

Steering Control and Tire Wear

Steering control and tire wear complaints are described as one or several of the following symptoms. The factors accounting for these troubles are listed on the next page, and the order of their likelihood is indicated under the symptom by the numbers appearing opposite the separate factors.

a. Tire Wear.

The type of tire wear (whether normal or abnormal) often indicates the cause. All tire wear falls into two broad classifications: around the tire (fore and aft wear) or across the tire wear.

The bottom (contact area) of the tire is or should be stationary regardless of the speed of the vehicle. Any resistance to rolling or any tendency to spin will cause movement and consequent wear.

If the tire leaves the road at a different point than where it contacts the road cross-wear will result. This is caused by toe-in, toe-out or excessive distortion due to high camber.

The rolling radius of the tire is always less than the actual radius and fore and aft or around the tire wear results. Camber (in effect making a cone of the wheel) would cause the tire to have several different rolling radii. Under-inflation or overloading would reduce the rolling radius.

b. Wander.

Wander is a term used to designate a tendency of the vehicle to slightly turn to one side or the other when the driver is trying to drive straight ahead. As an example, assuming the road is smooth and straight after a few rods the car is traveling toward the right side of the road without the driver having turned the steering wheel. The driver then turns the steering wheel until the car is again traveling straight ahead. The car now starts traveling to the left, and so on, with the result that the driver is continually working to keep the car traveling straight ahead.

c. Pull to One Side.

Pull to one side is a tendency for the vehicle to turn toward one side when the driver is trying to drive straight ahead. As a result the driver has to keep a constant pull on the steering wheel to drive straight ahead.

d. Wheel Tramp.

Wheel tramp is a shimmy that develops at high speed. It is usually called wheel tramp to distinguish it from a low speed shimmy. Wheel tramp is disagreeable and dangerous and is a destructive force that places undue strain on the entire vehicle.

e. Cupped Tires.

If the rolling radius of the tire is reduced to below normal by overloading or under-inflation or if the tire grooves are inadequate cupping will result. Camber (in effect making a cone of the wheel) would cause the tire to have several different rolling radii and cupping will result. Under-inflation or overloading would reduce the rolling radius.

f. Road Sway or Body Roll.

Road sway or body roll is a term used to designate a tendency of the vehicle to rock when encountering a cross wind. Body roll has a tendency to cause the driver to lean and at the same time turn the steering wheel. The result of this will cause the vehicle to weave or sway from side to side.

g. Jerky Steering.

The most common cause of jerky steering or road shock is failure to have the steering gear in mid-position (incorrect drag link adjustment). A bruised tire causing a blister or a boot in the tire could cause jerky steering.

h. Shimmy.

Shimmy is a term used to designate a tendency of the front wheels to jerk from side to side at low speed. The movement of the front wheels may or may not be transmitted through the steering wheel. The low speed shimmy usually starts while crossing railroad tracks or driving over a rough surface.

i. Loose Steering.

Loose steering is a looseness in the wheel and spindle assembly, steering connections or steering gear, including looseness where the steering gear housing is secured to the frame.

j. Hard Steering.

Hard steering can usually be attributed to tightness of the steering gear mesh adjustment or spindle pin bearings. Incorrect front wheel alignment or under-inflated tires could, likewise, cause hard steering.

k. Hard Turning When Stationary.

Hard turning when stationary is caused by under-inflated tires, tight steering gear or spindle pin bearings. High or low camber plus king pin side inclination could, likewise, cause hard steering when stationary.

l. Erratic Steering When Braking.

Erratic steering when the brakes are applied usually can be attributed to unequal brake adjustment, out-of-round drums, or under-inflation of the tires. These conditions will cause the vehicle to have a tendency to turn when the brakes are applied.

m. Tire Squeal on Turns.

A certain amount of slippage results between the tire and the road surface when a vehicle is turned at high speed and an occasional squeal will be heard from a vehicle in perfect alignment. The tendency to squeal is increased with under-inflation. Incorrect spindle arm angle (toe-out on turns) could increase the slippage (spindle arm angle is not critical).

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July 17, 1947

CARS TRUCKS BUSSES

DEALERS'

TROUBLE SHOOTING

SERVICE BULLETIN

Ford MERCURY LINCOLN

Symptom 3999 / Factors	A Tire wear	B Wander	C Pull to one side	D Wheel tramp	E Cupped tires	F Road sway	G Jerky steering	H Shimmy	I Loose steering	J Hard steering	K Hard turning when stationary	L Erratic steering when braking	M Tire squeal on turns
1 Tire pressure	1	2	1	11	1	1		1		1	1		1
2 Tight spindle bearings		1				2				2			
3 Loose spindle bearings	6				4		9	2	1				
4 Loose tie rod ends	14	11		6	3			4	3				
5 Loose drag link ends	15	10		5	2			3	2				
6 Loose spring U bolts		14		8	5	8		6	5			6	
7 Broken spring tie bolts	13	12	6	9	6	9		7	6			5	
8 Tire overload	5	19			8	5				6	7		
9 Broken spring	11	13	5	10	7	10		8	7			4	
10 Loose steering gear mountings		15		7		7		5	4				
11 Wheel balance	8			1	9		4						
12 Steering gear bind						6				3	2		
13 Caster low		4		4			10						
14 Bent Spindle		17	14				8			7			4
15 Camber plus side inclination unequal			9		13								3
16 Radius rod loose		16		14				9	8				
17 Toe-in too great	2	9											2
18 Radial run-out				2	10		5						
19 Lateral run-out				3	11		6						
20 Unequal brake adjustment	10		3									1	
21 Bent spindle arm		18	13										5
22 Camber low		3								5			
23 Caster high										4	3		
24 Caster uneven		5	8										
25 Camber plus side inclination high		6									4		
26 Camber plus side inclination low		7									5		
27 Steering gear off center			10				1						
28 Spring sag	12					11							
29 Loose or worn shock absorber				12		4							
30 Cupped tires				13			3						
31 Over-size tires								10			6		
32 Unequal tire diameter	7		2										
33 Bent rear axle housing	16		11										
34 Bent frame	20		12										
35 Dragging brakes	3		15										
36 Camber high	4												
37 Camber uneven			7										
38 Tight wheel bearings			4										
39 Loose wheel bearings												3	
40 Toe-in too little		8											
41 Incorrect drag link adjustment							2						
42 Loose or worn stabilizer						3							
43 Not tracking	9												
44 Rear axle toe-in	17												
45 Rear axle toe-out	18												
46 Rear axle camber	19												
47 Out-of-round brake drum					12							2	
48 Bent pitman arm							7						

Fig. 1—Causes of Trouble and Order of Probability

July 17, 1947

Fits, Tolerances and Wear Limits

GENERAL

Types	V-8					4-Cyl.	6-Cyl.	12-Cyl.		
	3 1/16 Bore	3 3/16 Bore	3 3/16 Bore	2.6 Bore	3.5 Bore	3 3/16 Bore	3.3 Bore	2 3/4 Bore	2 7/8 Bore	2 15/16 Bore
Taxable Horsepower	30	32.5	32.5	21.6	39.2	16.2	26.13	36.3	39.6	41.4
Bore (Inches)	3.062	3.187	3.187	2.6	3.5	3.187	3.30	2.75	2.875	2.937
Stroke (Inches)	3.75	3.75	4.000	3.2	4.375	3.75	4.40	3.75	3.75	3.75
Piston Displacement (Cubic Inches)	221	239	255.4	136	337	119.5	226	267	292	305
Firing Order	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2	1-5-4-8-6-3-7-2	1-2-4-3-	1-5-3-6-2-4	1-4-9-8-5-2-11-10-3-6-7-12		

VALVE TIMING

Engine	Year	Intake Opens (Degrees) B.T.C.	Intake Closes (Degrees) A.B.C.	Exhaust Opens (Degrees) B.B.C.	Exhaust Closes (Degrees) A.T.C.
V8-3 1/16 Bore	1932–36	9.5	54.5	57.5	6.5
V8-3 3/16 Bore	*1937	0.0	44.0	48.0	6.0
V8-2.6 Bore	1937–40	9.5	54.5	57.5	6.5
4-Cyl. 40 HP	*1939	6.0	22.0	38.0	6.0
6-Cyl. 90 HP	*1941	3.0	41.0	48.0	6.0
V12-2 3/4 Bore	1936–37	19.5	54.5	57.5	16.5
V12-2 3/4 Bore	1938–39	10.42	35.58	50.92	8.08
V12-2 7/8 Bore	1940–41 1946–47	10.42	35.58	50.92	8.08
V12-2 15/16 Bore	1942–46	10.42	35.58	50.92	8.08
6-Cyl. 3.3 Bore	1947	11.00	41.00	48.00	10.00
8RT-3 3/16 Bore	1948	0.0	44.00	48.00	6.00
8BA-3 3/16 Bore	1949	0.0	44.00	48.00	6.00
8E-3 1/2 Bore	1949	14.0	60.00	62.00	16.00
8CM-3 3/16 Bore	1949	10.0	50.00	50.00	10.00

*Year started and current to date of publication of this bulletin.

6010-6014—CYLINDER BLOCK

Part Number	Type	Mfg. Maximum Diameter (Inches)	Maximum Wear Limits (Inches)		
			Taper	Out-of-Round (Cast Iron Bore)	Out-of-Round (Steel Sleeve)
52-6010-C	90° V-8 Cyl.	2.601	0.005	—	0.005
92A-6010	90° V-8 Cyl.	2.601	0.005	—	0.005
022A-6010	90° V-8 Cyl.	2.601	0.005	—	0.005
ONY-6010	4 Cyl.	3.1875	0.006	—	0.005
29A-6010	90° V-8 Cyl.	3.1785	0.006	0.003	—
41A-6010-B2	90° V-8 Cyl.	3.0625	0.006	0.003	—
59A-6010-C	90° V-8 Cyl.	3.1875	0.006	0.003	—
1GA-6010	6 Cyl.	3.3005	0.006	0.003	—
2GA-6010	6 Cyl.	3.3005	0.006	0.003	—
H-6014-A	75° V-12 Cyl.	2.7505	0.006	0.003	—
HB-6014-A	75° V-12 Cyl.	2.7505	0.006	0.003	—
86H-6014-A	75° V-12 Cyl.	2.7505	0.006	0.003	—
96H-6014-A	75° V-12 Cyl.	2.7505	0.006	0.003	—
06H-6014-A	75° V-12 Cyl.	2.875	0.006	0.003	—
26H-6014-A	75° V-12 Cyl.	2.938	0.006	0.003	—
7HA-6010-B	6 Cyl.	3.301	0.006	0.003	—
8RT-6010	90° V-8 Cyl.	3.1885	0.006	0.003	—
8BA-6010	90° V-8 Cyl.	3.1885	0.006	0.003	—
8E-6010	90° V-8 Cyl.	3.500	0.006	0.003	—
8CM-6010	90° V-8 Cyl.	3.1885	0.006	0.003	—

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6049-6050—CYLINDER HEADS

Maximum permissible warpage—all cylinder heads $\frac{1}{32}$ inch.

Part Number R.H.	Part Number L.H.	Material	Compression Ratio	Compression Pressure at Cranking Speed**	Volume Cubic Centimeters
18-6049	18-6050	Cast Iron	5.5 to 1	100	70–72
40-6049-A	40-6050-A	Aluminum	6.32 to 1	113	58–61
40-6049-B	40-6050-B	Cast Iron	6.38 to 1	113	79–81
68-6049-B	68-6050-B	Cast Iron	6.3 to 1	112	78–81
77-6050-A	77-6050-A	Cast Iron	7.5 to 1	129	78–80
81A-6049-A	81A-6050-A	Cast Iron	6.2 to 1	113	77–79
	81A-6050-B	Aluminum	6.2 to 1	113	77–79 L.H.*
81A-6049-B		Aluminum	6.2 to 1	113	79–81 R.H.
	81T-6050-A	Cast Iron	5.9 to 1	108	82–84 L.H.*
81T-6049-A		Cast Iron	5.9 to 1	108	84–86 R.H.
99T-6049	99T-6050-A	Cast Iron	5.5 to 1	100	90–92
29A-6049	29A-6050	Cast Iron	6.4 to 1	120	78–80
59A-6050-A	59A-6050-A	Cast Iron	6.75 to 1	110	77–79
59A-6050-B	59A-6050-B	Cast Iron	6.75 to 1	115	73.5–75.5
2NC-6050		Cast Iron	6.00 to 1	103	88–90
52-6050-C	52-6050-C	Aluminum	6.6	116	39–43
52-6050-B	52-6050-B	Cast Iron	6.6	116	39–43
86H-6049-A	86H-6050-A	Aluminum	6.7 to 1	118	55.5
96H-6049	96H-6050	Cast Iron	6.7 to 1	118	58.0
06H-6049-A	06H-6050-A	Aluminum	7.2 to 1	125	62.0
06H-6049-B	06H-6050-B	Aluminum	7.2 to 1	125	62.0
06H-6049-C	06H-6050-C	Aluminum	7.2 to 1	125	62.0
16H-6049	16H-6050	Cast Iron	7.2 to 1	125	64.5
26H-6049-C	26H-6050-C	Cast Iron	7.1 to 1	125	64
1GA-6050-D		Cast Iron	6.7 to 1	117	109–111
7HA-6050-C		Cast Iron	6.8 to 1	110	92–94
8BA-6049-C	8BA-6050-C	Cast Iron	6.8 to 1	110	73–75
8RT-6049-C	8RT-6050-C	Cast Iron	6.8 to 1	110	73–75
8EQ-6049	8EQ-6050	Cast Iron	6.4 to 1	—	97–99
8EL-6049-B	8EL-6050-B	Cast Iron	7.0 to 1	—	84–86
8CM-6049-E	8CM-6050-E	Cast Iron	7.8 to 1	—	82–84

*Right-hand and left-hand heads have different volume due to the angle of the valves in the block.
**Plus or minus 10 lbs. Maximum variation between cylinders, 10 lbs.

April 8, 1948

6110—PISTONS

Part Number	Material	Dome	New Piston Fit								Worn Piston Fit							
			Cast Iron Bore				Steel Sleeve				Cast Iron Bore				Steel Sleeve			
			New		Worn		New		Worn		New		Worn		New		Worn	
			Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds	Gage Thickness	Pull Pounds
BB-6610-A	Aluminum	Flat	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
40-6110-A	Aluminum	Flat	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
52-6110-A	Steel	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
68-6110-A & B	Steel	Spherical	0.0025	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
91A-6110-A & B	Steel	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
11A-6110-A1	Aluminum	Spherical	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
01T-6110-A	Aluminum	Spherical	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
99A-6110-A	Steel	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
29A-6110-A	Steel	Spherical	0.0025	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
29B-6110-A	Aluminum	Spherical	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
09T-6110-A	Aluminum	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
09A-6110-A	Aluminum	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
2N-6110-A	Steel	Spherical	—	—	—	—	0.003	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.005	6–10
2GT-6110-A	Aluminum	Spherical	0.003	8–12	0.004	8–12	—	—	—	—	0.004	8–12	0.005	8–12	—	—	—	—
86H-6110-A to C	Steel	Spherical	0.002	5– 8	0.003	5– 8	—	—	—	—	0.003	5– 8	0.004	5– 8	—	—	—	—
06H-6110-B to D	Steel	Spherical	0.002	5– 8	0.003	5– 8	—	—	—	—	0.003	5– 8	0.004	5– 8	—	—	—	—
26H-6110-A to C	Steel	Spherical	0.002	5– 8	0.003	5– 8	—	—	—	—	0.003	5– 8	0.004	5– 8	—	—	—	—
7HA-6110-A2	Aluminum	Flat	0.002	6–10	0.004	6–10	—	—	—	—	0.004	6–10	0.004	6–10	—	—	—	—
8E-6110-A	Aluminum	Flat	0.0015	6–12	0.003	6–12	—	—	—	—	0.003	6–12	0.004	6–12	—	—	—	—
8CM-6110-A	Aluminum	Spherical	0.0015	6–12	0.003	6–12	—	—	—	—	0.003	6–12	0.004	6–12	—	—	—	—

6135—PISTON PINS

Part Number	Mfg. Maximum Diameter (Inches)	Mfg. Clearance Piston (Inches)	Wear Limit Clearance Piston (Inches)	Mfg. Clearance Connecting Rod Bushings (Inches)	Wear Limit Clearance Connecting Rod Bushings (Inches)
18-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
48-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
52-6135-A	0.6879	0.0004	0.0015	0.0002–0.0005	0.0015
78-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
99A-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
19A-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
1GA-6135-A	0.8504	0.0005	0.0015	0.0002–0.0005	0.0015
49T-6135	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
H-6135-B	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
06H-6135-A	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015
7HA-6135	0.8504	0.0003	0.0015	0.0002–0.0005	0.0015
8E-6135-A	0.8504	0.0001–0.00005	0.001	0.0001–0.0002	0.0012
8CM-6135	0.7504	0.0005	0.0015	0.0002–0.0005	0.0015

6149 through 6153—PISTON RINGS

	Mfg. Clearance in Piston Groove	Wear Limit Clearance in Piston Groove	End Gap	Wear Limit
Top piston ring	0.0015–0.0035	0.0045	0.012–0.017	0.035
Lower piston rings	0.001 –0.004	0.005	0.012–0.017	0.035
8E—Top comp. rings	0.002 –0.0035	0.0045	0.008–0.016	0.035
8E—2nd, 3rd, 4th rings	0.0015–0.0030	0.0040	0.008–0.016	0.035
8CM—Top comp. rings	0.0015–0.0030	0.0040	0.010–0.017	0.035
8CM—2nd ring	0.0010–0.0025	0.0035	0.010–0.017	0.035
8CM—3rd, 4th rings	0.0015–0.0030	0.0040	0.010–0.017	0.035

6200—CONNECTING ROD

Part Number	Mfg. Maximum Diameter Crankpin End (Inches)	Wear Limit Diameter Crankpin End (Inches)	Mfg. Diameter Piston Pin Bushing (Inches)	Wear Limit Diameter Piston Pin Bushing (Inches)	Mfg. Side Clearance Total (Inches)	Wear Limit Side Clearance Total (Inches)
18-6200	2.2203	2.2215	0.7506	0.7535	0.006–0.014	0.020
48-6200	2.2203	2.2215	0.7506	0.7535	0.006–0.014	0.020
52-6200	1.8005	1.8015	0.6881	0.6909	0.006–0.014	0.020
92A-6200	1.9005	1.9015	0.6881	0.6909	0.006–0.014	0.020
9N-6200-B	2.2203	2.2215	0.7506	0.7535	0.006–0.014	0.020
21A-6200	2.2203	2.2215	0.7506	0.7535	0.004–0.008	0.010
29A-6200	2.3603	2.3615	0.7505	0.7535	0.006–0.014	0.020
2GA-6200	2.3600	2.3615	0.8506	0.8535	0.003–0.007	0.010
H-6200-B	2.2985	2.2995	0.7506	0.7536	0.006–0.014	0.020
H-6200-C	2.298	2.2995	0.7506	0.7536	0.006–0.014	0.020
HB-6200	2.298	2.2995	0.7506	0.7536	0.006–0.014	0.020
86H-6200	2.2985	2.2995	0.7506	0.7536	0.006–0.014	0.020
26H-6200	2.4225	2.4245	0.7506	0.7536	0.006–0.014	0.020
7HA-6200	2.4235	2.4250	0.8506	0.8535	0.006–0.014	0.017
8BA-6200	2.2910	2.2922	0.7506	0.7536	0.006–0.014	0.022
8E-6200	2.5520	2.5540	0.8506	0.8536	0.007–0.013	0.022
8CM-6200	2.2910	2.2922	0.7506	0.7536	0.006–0.014	0.022

6211—CONNECTING ROD BEARINGS

Part Number	Mfg. Maximum Wall Thickness (Inches)	Wear Limit Wall Thickness (Inches)	Mfg. Crankpin Clearance (Inches)	Wear Limit Crankpin Clearance (Inches)
52-6211-A	0.0998	0.0985	0.0015–0.0035	0.005
48-6211-A	0.1095	0.1085	0.0017–0.0036	0.005
81A-6211-A	0.1095	0.1085	0.0017–0.0036	0.005
92A-6211-A	0.0998	0.0985	0.0015–0.0035	0.005
99A-6211-A	0.1095	0.1085	0.0017–0.0038	0.005
9N-6211-A	0.0623	0.0595	0.0009–0.0025	0.005
1GA-6211-A	0.0623	0.0595	0.003 –0.0017	0.005
H-6211-C	0.0855	0.0838	0.001 –0.0025	0.005
26H-6211-A	0.0855	0.0838	0.001 –0.0075	0.005
7HA-6211-A3	0.0621	0.0593	0.000 –0.0025	0.005
8BA-6211-A1-2	0.0755	0.0745	0.0005–0.0030	0.005
8E-6211	0.0755	0.0745	0.0004–0.0024	0.005
8CM-6211	0.0755	0.0745	0.0005–0.0030	0.005

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6261-6263—CAMSHAFT BEARINGS

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)
01A-6261-C	1.7985	1.8015
022A-6261-C	1.4995	1.5025
01A-6262-A1-2	1.7985	1.8015
1GA-6262-C	1.7985	1.8015
8E-6262-A	1.9285	1.9315
8E-6263-A	1.9285	1.9315

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)
16H-6261	1.7998	1.8020
16H-6262	1.7998	1.8020
16H-6263	1.7998	1.8020
7HA-6262-A	1.9285	1.9315

6303—CRANKSHAFTS

Part Number	Mfg. Maximum Diameter (Inches)		Maximum Out-of-Round Wear, Crankpin and Main Journals (Inches)	Maximum Taper Wear Main and Crankpin Journals (Inches)	Mfg. End Play Clearance (Inches)	End Play Wear Limit Clearance (Inches)
	Main Journals	Crankpin Journals				
52-6303-B	1.9990	1.5990	0.0015	0.001	0.002–0.006	0.008
68-6303-A	2.3990	1.9990	0.0015	0.001	0.002–0.006	0.008
91A-6303-A	2.4990	1.9990	0.0015	0.001	0.002–0.006	0.008
99A-6303-A	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008
99A-6303-B	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008
9N-6303	2.2490	2.0945	0.0015	0.001	0.002–0.006	0.008
022A-6303	2.0990	1.699	0.0015	0.001	0.002–0.006	0.008
1GA-6303-A	2.4990	2.2350	0.0015	0.001	0.002–0.006	0.008
29A-6303-A	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008
29A-6303-B	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008
H-6303-B	2.4010	2.1260	0.0015	0.001	0.002–0.006	0.008
26H-6303-A	2.4010	2.2500	0.0015	0.001	0.002–0.006	0.008
B-6303-B	1.6240	1.4990	0.0015	0.001	0.002–0.006	0.008
18-6303-A2	1.9990	1.9990	0.0015	0.001	0.002–0.006	0.008
7HA-6303	2.8740	2.2988	0.0015	0.001	0.003–0.006	0.008
8BA-6303	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008
8E-6303	2.8740 F and C 2.8735 Rear	2.400	0.0015	0.001	0.004–0.008	0.010
8CM-6303	2.4990	2.1390	0.0015	0.001	0.002–0.006	0.008

6331—CRANKSHAFT MAIN BEARINGS

Part Number	Mfg. Maximum Wall Thickness (Inches)	Wear Limit Wall Thickness (Inches)	Mfg. Clearance Between Bearing and Shaft (Inches)*	Wear Limit Clearance Between Bearing and Shaft (Inches)
68-6331	0.0855	0.0835	0.000 –0.003	0.005
81A-6331	0.0855	0.0835	0.000 –0.003	0.005
1GA-6331	0.0855	0.0835	0.000 –0.003	0.005
92A-6331	0.0855	0.0835	0.000 –0.003	0.005
52-6331-A	0.0855	0.0835	0.000 –0.003	0.005
9N-6331-A	0.0855	0.0835	0.000 –0.003	0.005
70-6331-A	0.0855	0.0835	0.000 –0.003	0.005
81B-6331-A	0.0855	0.0835	0.000 –0.003	0.005
7HA-6331-A3	0.0958	0.0938	0.0009–0.0032	0.0052
8E-6331-A	0.0958	0.0938	0.001 –0.003	0.005
8CM-6331-A	0.0855	0.0835	0.000 –0.003	0.005

*Selective fit—crankshaft to turn free.

6333 to 6342—CRANKSHAFT MAIN BEARINGS

Part Number	Mfg. Wall Thickness (Inches)	Wear Limit Wall Thickness (Inches)	Mfg. Clearance (Inches)*	Wear Limit Clearance (Inches)
9N-6333-A	0.0855	0.0835	0.000 –0.003	0.005
68-6333-A	0.0855	0.0835	0.000 –0.003	0.005
81A-6333-A	0.0855	0.0835	0.000 –0.003	0.005
52-6333-A	0.0855	0.0835	0.000 –0.003	0.005
92-6333-A	0.0855	0.0835	0.000 –0.003	0.005
1GA-6333-A	0.0855	0.0835	0.000 –0.003	0.005
1GA-6337-A	0.0855	0.0835	0.000 –0.003	0.005
1GA-6338-A	0.0855	0.0835	0.000 –0.003	0.005
H-6337-C	0.10050	0.0987	0.000 –0.003	0.005
H-6338-C	0.10050	0.0987	0.000 –0.003	0.005
H-6342-C	0.10050	0.0987	0.000 –0.003	0.005
7HA-6333-A	0.0958	0.0938	0.0009–0.0032	0.0052
8E-6333-A	0.0958	0.0938	0.0004–0.0024	0.0044
8E-6342-A	0.0958	0.0938	0.0004–0.0024	0.0044
8CM-6333-A	0.0855	0.0835	0.0000–0.003	0.005

*Selective fit—crankshaft to turn free.

6500—VALVE PUSH RODS

Part Number	Mfg. Clearance in Block (Inches)	Wear Limit Clearance in Block (Inches)	Mfg. Minimum Push Rod Diameter (Inches)	Wear Limit Diameter (Inches)	Length Limit After Resurfacing (Inches)
52-6500-A1	0.0005–0.0015	0.003	0.8290	0.8275	1.700
52-6500-A2	0.0005–0.0015	0.003	0.8290	0.8275	1.700
91A-6500-A	0.0005–0.0015	0.003	0.9994	0.9979	1.700
18-6500-A	0.0005–0.0015	0.003	0.9980	0.9965	1.700
16H-6500-A	0.0005–0.0015	0.003	0.9990	0.9975	Self-adjusting
7HA-6500-A1	0.0005–0.0015	0.003	0.6240	0.6225	Adjustable
8BA-6500-A	0.0007–0.0016	0.003	0.9992	0.9977	1.700
8E-6500	0.0003–0.0018	0.003	0.7177	0.7167	Self-adjusting
8CM-6500-B	0.0007–0.0016	0.003	0.9992	0.9977	1.728

6505—6507—VALVES

Part Number	Seat Angle (Degrees)	Mfg. Minimum Diameter Stem (Inches)	Wear Limit Diameter of Stem (Inches)	Mfg. Clearance Valve Stem to Guide (Inches)	Wear Limit Clearance Valve Stem to Guide (Inches)		Mfg. Valve Stem to Push Rod Clearance (Inches)			
							Exhaust		Intake	
					Exhaust	Inlet	Max.	Min.	Min.	Max.
11T-6505-A	45	0.3095	0.3065	0.0025–0.0045	0.006	0.005	0.014	0.016	0.010	0.012
HT-6505-B	45	0.3095	0.3065	0.0025–0.0045	0.006	0.005	0.014	0.016	0.010	0.012
1GA-6505-A	45	0.3095	0.3065	0.0025–0.0045	0.006	0.005	0.013	0.015	0.013	0.015
1GT-6505-A1	45	0.3095	0.3065	0.0025–0.0045	0.006	0.005	0.013	0.015	0.013	0.015
5GA-6505	45	0.3095	0.3065	0.0025–0.0045	0.006	0.005	0.013	0.015	0.013	0.015
06H-6505	45	0.3105	0.3065	0.0015–0.0035	0.006	0.005	0.000	0.000	0.000	0.000
1GA-6507	45	0.3105	0.3080	0.0015–0.0035	0.006	0.005	0.013	0.015	0.013	0.015
5GA-6507	45	0.3105	0.3080	0.0015–0.0035	0.006	0.005	0.013	0.015	0.013	0.015
7HA-6505-A	45	0.3405	0.3375	0.0015–0.0035	0.006	0.005	0.013	0.015	0.013	0.015
7HA-6507	45	0.3410	0.3385	0.0010–0.0031	0.0056	0.0046	0.013	0.015	0.013	0.015
*8BA-6507	45	0.3405	0.3375	0.0015–0.0035	0.006	0.005	0.013	0.015	0.013	0.015
8EL-6505	45	0.3405	—	0.0022–0.0037	0.006	—	0.000	0.000	0.000	0.000
**8EL-6507	45	0.3412	—	0.0015–0.003	—	0.005	0.000	0.000	0.000	0.000
8EQ-6505	45	0.3405	—	0.0022–0.0037	0.006	—	0.000	0.000	0.000	0.000

*Used for 8CM Engine.
**Used for 8EQ Engine.

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6513—VALVE SPRING

Part Number	Test Length (Inches)	Pressure (Pounds)
52-6513	2.05	26 to 30
*78-6513	2.125	37 to 40
86H-6513	2.125	51 to 57
2NC-6513	2.125	31 to 34
7HA-6513	2.109	47 to 53
8E-6513	1.680	63 to 69

*Used for 8CM Engine.

6606—OIL PUMP DRIVEN GEAR SHAFT

Part Number	Mfg. Maximum Diameter (Inches)	Wear Limit Diameter (Inches)
*41A-6606-A1	0.435	0.434
**56H-6606-A	0.4945	0.4935

*Used for 8CM Engine.
**Used for 8E Engine.

6608—OIL PUMP SHAFT AND DRIVE GEAR

Part Number	Mfg. Maximum Shaft Bearing Surface Diameter (Inches)	Wear Limit Shaft Bearing Surface Diameter (Inches)
18-6608-B	0.4975	0.497
52-6608	0.562	0.5615
9N-6608	0.562	0.5615
5GA-6608	0.562	0.5615
41A-6608	0.4975	0.497
5GA-6608	0.562	0.5615
41A-6608	0.562	0.5615
56H-6608	0.4975	0.497
8E-6608-C	0.4975	0.497
8CM-6608	0.4975	0.497

6610—OIL PUMP DRIVEN GEAR

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)	Mfg. Clearance Driven Gear and Shaft (Inches)	Wear Limit Clearance Driven Gear and Shaft (Inches)
18-6610	0.438	0.439	0.002–0.0035	0.005
52-6610-A	0.438	0.429	0.002–0.0035	0.005
52-6610-B	0.438	0.439	0.002–0.0035	0.005
1GA-6610-B	0.438	0.439	0.002–0.0035	0.005
41A-6610-A	0.438	0.439	0.002–0.0035	0.005
8E-6610-B	0.497	0.498	—	—
8CM-6610-A	0.438	0.498	—	—

6612—OIL PUMP SHAFT BUSHING

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)	Mfg. Clearance Bushing and Shaft (Inches)	Wear Limit Clearance Bushing and Shaft (Inches)
B-6612-A	0.499	0.502	0.001–0.003	0.005
52-6612-A	0.563	0.5665	0.001–01003	0.005
9N-6612	0.563	0.5665	0.001–0.003	0.005
*B-6612-A	0.499	0.502	0.0005–0.0025	0.005

*Used for 8E Engine and 8CM Engine.

6654-6670—OIL PUMP RELIEF VALVE SPRING

Part Number	Compressed to (Inches)	Pressure (Ounces)
*01A-6654	1.38	43–49
1GA-6654	1.40	44–46
41A-6654	1.38	78-87
**41A-6654	1.38	78-87
H-6654	1.38	36.8–43.2
86H-6654	0.53	33.6–36
7HA-6654	1.14	12.62-12.88
***56H-6654	1.14	15 lbs. 2 oz.–15 lbs. 6 oz.
8E-6670-C	2.18	199

*Used in cylinder block with no relief valve in oil pump.
**Used in cylinder block with relief valve in oil pump.
***Used for 8CM Engine.

6656—OIL PUMP IDLER GEAR SHAFT

Part Number	Mfg. Minimum Diameter (Inches)	Wear Limit Diameter (Inches)
18-6656-A	0.748	0.747
*8BA-6656-B	0.748	0.747

*Used for 8E and 8CM Engines.

6657—IDLER GEAR BUSHING

Part Number	Mfg. Maximum Diameter (Inches)	Wear Limit Diameter (Inches)	Mfg. Clearance on Shaft (Inches)	Wear Limit Clearance on Shaft (Inches)
*18-6657-A	0.750	0.752	0.0005–0.002	0.005

*Used for 8E and 8CM Engines.

6610—OIL PUMP OUTER ROTOR

Part Number	Mfg. Maximum Outside Diameter (Inches)	Wear Limit Outside Diameter (Inches)	Mfg. Clearance Outer Rotor and Pump Body (Inches)	Wear Limit Outer Rotor and Pump Body (Inches)
7HA-6610	2.249	2.245	0.005–0.010	0.012

6614—INNER ROTOR

Part Number	Mfg. Maximum Clearance Inner and Outer Rotor (Inches)	Wear Limit Clearance Inner and Outer Rotor (Inches)	Mfg. Maximum Clearance Rotor and Cover (Inches)	Wear Limit Clearance Rotor and Cover (Inches)
7HA-6614	0.006	0.010	0.0005–0.0035	0.0050

6604—PUMP BODY

Part Number	Mfg. Maximum Inside Diameter of Pump Body (Inches)	Wear Limit Inside Diameter of Pump Body (Inches)
7HA-6604	2.258	2.260

6609—PUMP SHAFT

Part Number	Mfg. Maximum Shaft Diameter (Inches)	Wear Limit Shaft Diameter (Inches)	Mfg. Maximum Shaft End Play (Inches)	Wear Limit Shaft End Play (Inches)
7HA 6609	0.5195	0.5170	0.004–0.008	0.010

TORQUE WRENCH READINGS

Parts	8-Cyl. Pounds-Feet	6-Cyl. Pounds-Feet	12-Cyl. Pounds-Feet	4-Cyl. Pounds-Feet	8E Pounds-Feet
Spark plugs	24–28	24–28	24–28	24–28	24–28
Main bearing self-locking nuts or bolts	80–90	80–90	—	—	120–130
Main bearing nuts (castellated)	80–90	75–80	60–70	75–80	—
Connecting rod castellated nuts	35–40	35–40	40–45	35–40	—
Connecting rod self-locking nuts	40–45	40–45	—	—	52–60
Cylinder head nuts (cast iron heads)	50–60	50–60	40–50	50–55	60–65
Cylinder head nuts (aluminum heads)	35–40	—	35–40	—	—
Flywheel self-locking cap screws	80	80	—	—	75–85
Flywheel cap screws (lock wired)	65–70	65–70	45–55	65–70	—
Vibration damper to crankshaft	—	—	—	—	140–150

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Rouge 337 Truck V-8 Engine

"EQ" SERIES

The new F-7 2½ and F-8 3-Ton trucks introduced in 1948 are powered by a new V-8 engine. The cylinder bore is 3½ inches and the stroke 4⅜ inches. The piston displacement is 337 cubic inches.

a. Cylinders and Pistons.

The cylinders and upper crankcase are cast in one piece. The pistons are of aluminum alloy, tin plated and cam ground, with four piston rings, all above the piston pin. The upper ring is porous chrome plated. The floating piston pins are of tapered tubular design and are secured by retaining rings. The combustion chamber is of the turbulent type with a 6.4 compression ratio.

b. Crankshaft and Bearings.

The 90 pound crankshaft is of alloy steel, drop forged, and is fully counterbalanced with six integral counterweights. The shaft is 28.5 inches long, with main bearing journals 2.873 inches in diameter. The three steel-backed copper lead main bearings are of the precision thin shell, replaceable type. The main bearing caps are secured by self-locking bolts. The connecting rod bearings are steel backed copper lead, thin shell locked-in type and are easily replaced. The connecting rod cap bolt nuts are secured by "pal nuts." The heavy truck type flywheel is secured to the crankshaft by self-locking bolts.

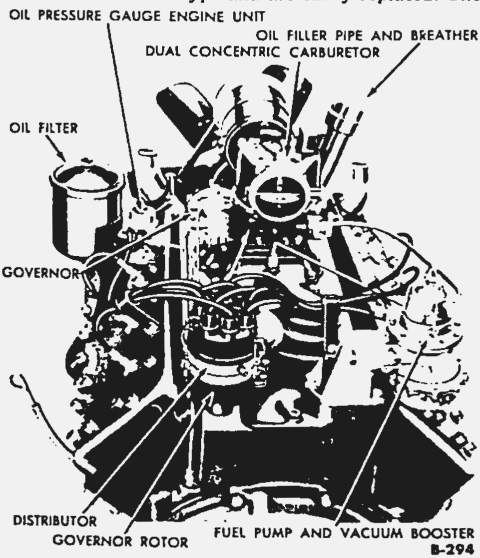


Fig. 1—Engine, Rear View

c. Camshaft and Valves.

The camshaft is of forged steel with high-lift "parabolic" cams and is geared directly to the crankshaft. The timing gear is of aluminum. The hydraulic push rods are zero-lash type. Small diameter one-piece valve guides are used, with hard faced, silichrome exhaust valves. The exhaust valve seat inserts are of molybdenum chrome alloy steel. The valve springs are of the non-dancing type, shot-blasted and rust proofed.

d. Engine Oil System.

The large capacity, high pressure gear type oil pump is driven from the rear of the camshaft. Two oil relief valves are provided, one in the pump which maintains a pressure of 50 pounds for lubrication, and the other in the front end of the cylinder block which reduces the pressure to 15 pounds for the hydraulic push rods. A large diameter flat-type oil intake screen is used with a short direct pipe to the pump. All the main, connecting rod, and camshaft bearings, and the valve lifters are pressure lubricated. The truck-type oil pan is fitted with a large clean-out plate. The oil filter element is of the replaceable type. The oil capacity for a dry engine is 10 quarts. Crankcase ventilation is of the road draft suction type with the inlet to the valve chamber, and the outlet is through a road draft tube from the crankcase.

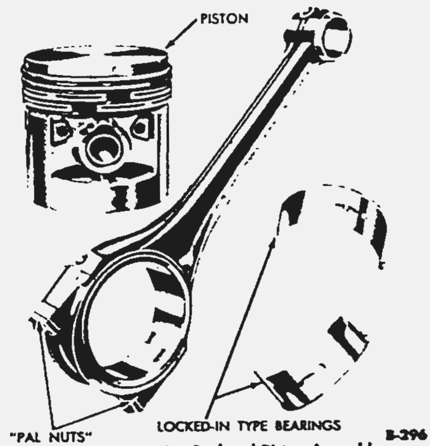


Fig. 2—Connecting Rod and Piston Assembly

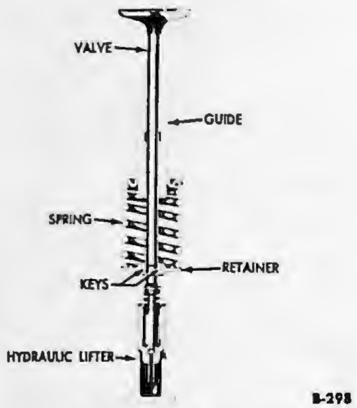


Fig. 3—Valve and Hydraulic Push Rod

e. Cooling System.

The cooling is of the series flow type. The water is forced from the pumps through the cylinder blocks to the rear, and up into and forward through the cylinder heads. Two high capacity water pumps—one in each cylinder block—are fitted with curved impeller blades for increased effectiveness. The pumps are of the packless, self-lubricating type. The 20-inch truck-type 4-blade fan is mounted on an oversize drive shaft. The thermostatic water temperature control is of the recirculating type. The radiator cap is of the pressure valve type.

f. Fuel System.

The high pressure (3½ to 4½ pounds) diaphragm-type fuel pump is driven from the rear of the camshaft by a push rod which is drilled for pressure lubrication. The pump is provided with an integral glass settling bowl with an inlet strainer screen. The balanced duplex intake manifold is arranged to charge cylinders alternately from each carburetor and is integral with the valve chamber cover. The dual concentric downdraft carburetor with all metering jets and passages located in the center of the float bowl provides for correct metering of fuel and air at all operating angles. All air entering the carburetor is filtered by an oil bath air cleaner with a seal-tight V-clamp mounting. The governor is made up of two units. The vacuum diaphragm unit is integral with the carburetor, and the rotor control unit is mounted in a housing directly under the ignition distributor. The rotor and distributor are driven by a common shaft. The govenor is standard equipment and is set to limit engine speed to 3400 R.P.M. under load and 3600 R.P.M. no load.

Fig. 4—Engine Oil Pump Z7-356

Fig. 5—Series Flow Cooling

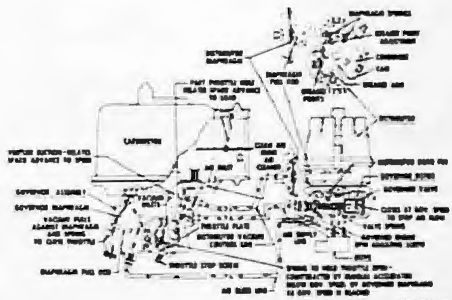
g. Ignition System.

The full automatic vacuum controlled distributor is accessibly mounted at the top rear of the engine. The distributor assembly is mounted above the governor rotor assembly and is secured to the rotor housing by an easily removable clamp. A single breaker arm is used with a breaker gap of 0.014 to 0.016 inch. The metal clad coil is mounted adjacent to the distributor. The ignition wiring is of the open type, and is secured by rubber grommets to reduce dielectric loss.

h. Electrical System.

The high output generator has a capacity of 7 volts, 40 amperes, and 280 watts. The voltage and current are fully controlled by the regulator. The generator reaches capacity at the low engine speed of 900 R.P.M.

The high torque starter is self-engaging and is operated by a push button on the instrument panel connected to a relay.



B-305

Fig. 6—Governor System

The information contained in these bulletins will prove of much value to salesmen, as well as to servicemen.

The opportunity of keeping up with mechanical changes should not be overlooked.

CARS TRUCKS BUSSES

DEALERS'

SERVICE BULLETIN

Ford Mercury Lincoln

"H" and "M" Series Engines

Starting in September, 1947, the 6-cylinder "G" series will be replaced by the "H" series and "M" series engines in production. Some of the major changes involved are the distributor, oil pump, camshaft, and valve assembly. Changes have also been made in the dimensions of various parts throughout these engines.

Complete specifications for the "H" and "M" engines have been added to the engine specifications.

The "H" and "M" engines are identical in design with the exception of the cylinder bore sizes. The "H" engine has a bore of 3.3 inches, and the "M" engine has a bore of 3.5 inches. The major changes in these engines are described in the following paragraphs.

a. Ignition. The distributor used on both the "H" and "M" engines is mounted on the left side of the engine (fig. 1) and driven off the oil pump driven gear. Description and ignition timing of these distributors are given under subject 12000.

b. Valve and Camshaft Assembly. Adjustable tappets are used in the "H" and "M" engines (fig. 2). The tappet adjusting screw is self-locking (no lock nut is required). The valve guides are the solid one piece type instead of the split type as used in the "G" series engine. These valve guides are pressed into the cylinder block to a specified depth (fig. 4). The valve spring is held in place by two keys and a spring retainer. The upper end of the valve spring seats against the cylinder block.

The camshaft used with the "H" and "M" engines differs from the one used with the "G" engine in that a gear is provided at the center of the camshaft (fig. 2). This gear drives the oil pump and distributor.

(1) *VALVE CLEARANCE ADJUSTMENT.*

NOTE: ***The valve clearance is adjusted with the engine cold.***

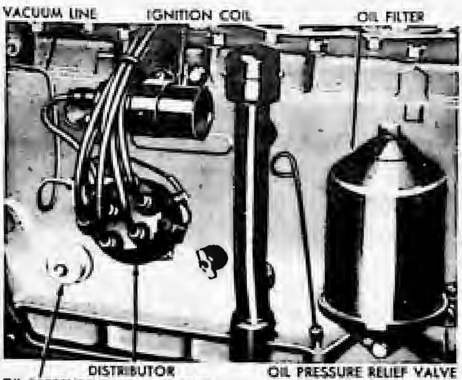


Fig. 1—Left Side View of Engine

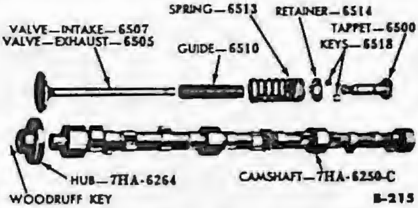


Fig. 2—Valve and Camshaft, Disassembled

When making the valve adjustment, use the correct size thickness gauge, being sure it is not crimped, bent, or dirty. Crank the engine until the tappet is on the heel of the cam. Start the thickness gauge between the tappet adjusting screw and the valve stem. If the gauge does not enter, turn the tappet adjusting screw clockwise until the thickness gauge slides through with a slight drag (fig. 3). If there is excessive clearance, turn the tappet adjusting screw counterclockwise.

NOTE: ***Do not use force when sliding the gauge between the valve stem and tappet adjusting screw.***

If the vehicle is to be driven at high speeds, an additional 0.002 inch for the exhaust valves is desirable.

(2) *VALVE SPRINGS.* When valve springs are removed, check them for proper tension according to specifications. If the valve springs are not within the specified limits, they should be replaced. When installing valve springs, the end having the closely spaced coils must be installed facing upward or against the cylinder block.

(3) *VALVE REMOVAL.* To remove the valves, drain the water from the radiator and remove the cylinder head and gasket. Remove the valve cover plate. Compress the valve spring by lifting the retainer and remove the two valve keys. Lift out the valve. Remove the valve spring and spring retainer.

NOTE: ***To prevent the valve keys from dropping through the oil drain holes in the valve chamber, cover the oil drain holes with a piece of cloth.***

To install valves, start the valve through the valve guide. Hold the valve spring and spring retainer in place in the valve chamber. Lower the valve through the spring. Holding the valve down, compress the

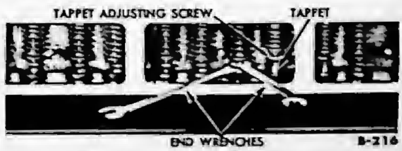


Fig. 3—Adjusting Valve Clearance

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Sept. 17, 1947

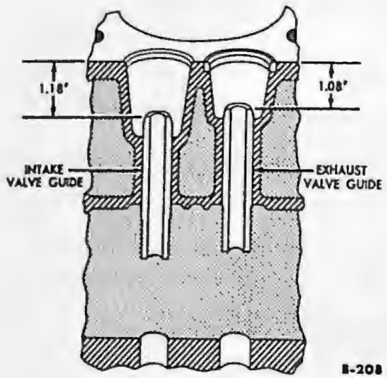

Fig. 4—Valve Guide Depth in Cylinder Block

valve spring. Install the two valve keys in the groove provided at the bottom of the valve stem. Be sure the valve keys are installed with the taper facing upward. Check, and, if necessary, adjust the tappets.

(4) *VALVE GUIDE REMOVAL.* Use special tool 6510-0 to remove the valve guides.

To install, place the valve guide in position on the cylinder block. Using special tool 6510-N, drive the valve guide down to the depth shown in fig. 4. The exhaust valve guide should measure 1.08 inches and the intake valve guide 1.18 inches from the top of the valve guide to the cylinder block surface after the valve guides are installed.

e. Engine Oil System.

(1) *OIL PUMP.* An externally mounted rotor type oil pump (fig. 5) is used on the "H" and "M" engines, instead of the gear type as used on the "G" engine. The oil pump is driven off a gear provided on the camshaft (fig. 2). The driven gear on the oil pump is provided with internal splines which drive the distributor shaft.

(2) *OIL PRESSURE RELIEF VALVE.* A non-adjustable oil pressure relief valve is located on the left side of the engine and is easily accessible (fig. 1).

(3) *OIL FILTER.* The oil filter is mounted directly over an opening on the left side of the cylinder block (fig. 1). The oil inlet and outlet passages to the oil filter are cast enblock, completely eliminating external oil lines.

(a) Removal and Disassembly of Rotor Type Oil Pump. Remove the distributor cap and turn the crankshaft until the rotor is in firing position for number one cylinder. In this position, it will be point-

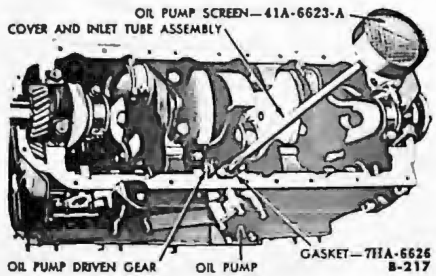

Fig. 5—Oil Pump and Screen

ing toward the oil hole on the distributor. Keep the crankshaft in this position while the pump is off the engine. Remove the long screws securing the oil pump to the engine, and pull off the pump. Turn the pump upside down, and turn the drive shaft until the outer rotor slips out of the housing (fig. 6). Drive out the pin securing the driven gear to the shaft, and press the drive gear off the shaft. Remove the shaft and inner rotor assembly from the pump body.

(b) Assemble and Install Oil Pump. Insert inner rotor and shaft assembly into pump body (fig. 6). Line up the pin hole in the driven gear with the hole in the shaft, and press the gear on the shaft.

NOTE: *New shafts are not drilled, install the new shafts as outlined above. Install the new drive gear on the shaft allowing 0.004 inch drill clearance between the drive gear and pump body. Drill the shaft.*

Install the pin, peening over both ends. Slide the outer rotor in position in the pump body, and install the cover, using a new cover gasket. Carefully install the oil pump in the engine using a new gasket, being sure the distributor rotor has not moved from number one firing position. It may be necessary to turn the oil pump driven gear to line up the splines with the distributor shaft. Install the screws securing the pump to the engine. Install the distributor cap.

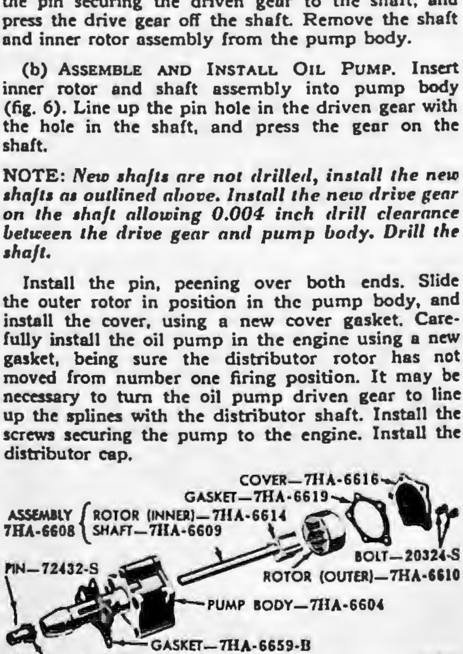

Fig. 6—Rotor Type Oil Pump, Disassembled

Sept. 17, 1947

CARS TRUCKS BUSSES
DEALERS'
SERVICE BULLETIN
FORD MERCURY LINCOLN

Engine Tune-Up

An engine tune-up operation is intended to restore an engine to normal operating condition. It is a correction procedure and not a mere checking procedure. The engine tune-up has to do only with parts or units that influence engine performance and does not take into account the generating, starting and lighting systems, nor the horn and instruments.

If possible, perform the combustion analysis test while the vehicle owner is present so that he may observe the results of the test prior to the engine tune-up (fig. 1).

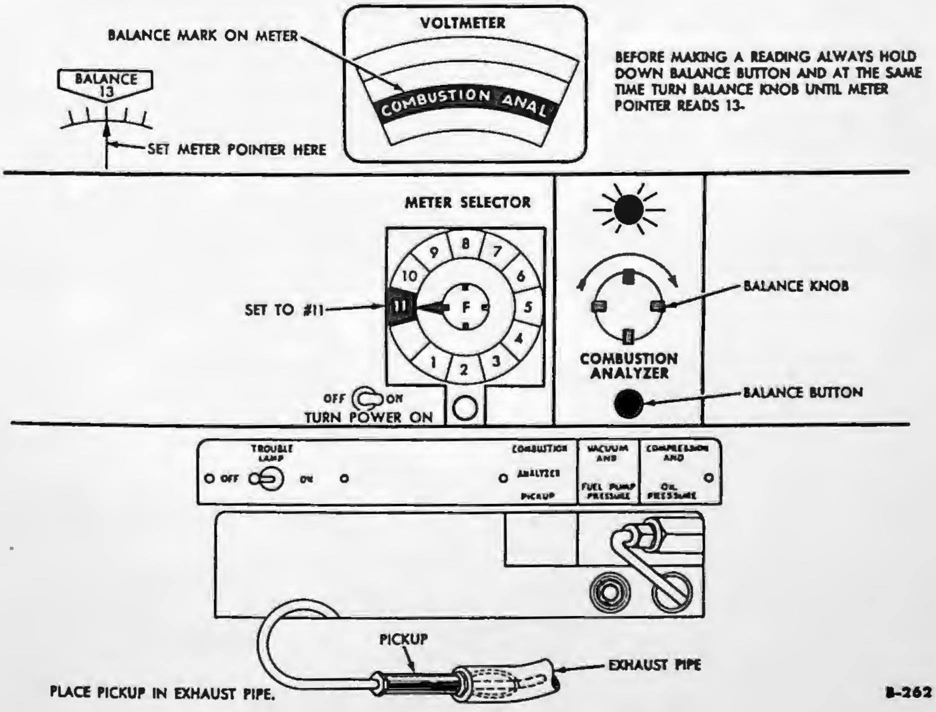

Fig. 1—Combustion Analyzer

The engine tune-up provides for correction at no extra cost (except for parts) for all units except the engine proper. Extra charges are made for corrections involving the removal of heads, manifolds, front covers, etc. Since this operation provides for correction, time to repair and clean the carburetor, fuel pump, and distributor is included, and where exchange assemblies are used instead of repairs, the tune-up charge is reduced by the amount indicated.

Specifications referred to in this procedure are given in Service Bulletins under subjects 6000, 9000, and 12000.

a. Test Cylinder Compression.

Operate the engine until normal operating temperature is reached. Remove all spark plugs. Set the throttle to the wide open position, and leave it open during this test. Test the compression of each cylinder (fig. 2).

FORMULA: *Normal compression = Atmospheric pressure x compression ratio + atmospheric pressure + 5.*

The compression of all cylinders should be uniform within ten pounds.

A reading of more than ten pounds above normal indicates the presence of carbon or lead deposits in the cylinders (extra charge to remove).

A below-normal reading indicates leakage. This leakage may be at the rings, valves, or gaskets. Notify the owner that the engine cannot be tuned up successfully until corrective measures have been taken (extra charge for correction).

b. Tighten All Cylinder Head Nuts and Manifold Bolts.

Tighten the manifold bolts as required and the cylinder head nuts from 40 to 45 pounds-feet for cast iron heads and from 35 to 40 pounds-feet for aluminum heads.

c. Clean, Adjust, and Install Spark Plugs.

Sand-blast the spark plugs, wipe the porcelain clean, and adjust the spark gap to 0.025 inch for plastic case coils or 0.030 inch for metal can type coils. Replace any plugs that have broken or chipped porcelain, or badly burned electrodes. Install spark plugs in the engine, and tighten to the required torque (see Subject 6000).

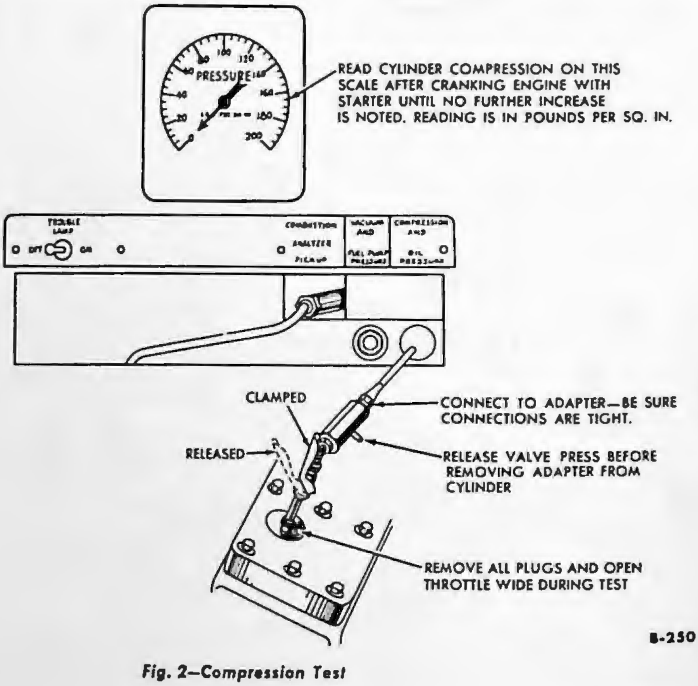

Fig. 2—Compression Test

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d. Clean and Inspect Battery and Cables.

Remove battery cables, clean battery and cable connectors. Inspect battery case for cracks and leaks, and the cables for worn insulation and deteriorated connectors. Replace or repair if required. Reinstall cables and tighten connectors.

e. Test Battery.

Test the battery (fig. 4), and recharge or replace if required. (Extra charge to recharge the battery.)

f. Test and Adjust or Repair Distributor.

Test and adjust the distributor on the ignition stroboscope, making repairs or replacements as required. Time includes adjusting the vacuum brake on direct drive type distributors on the stroboscope. (If exchange distributor is used, deduct .5 hr. from tune-up charge.)

g. Time Ignition (Gear Driven Distributors).

Time the ignition on the engine.

h. Clean and Inspect the Distributor Cap and/or Terminal Plates.

Clean and inspect the distributor cap and/or terminal plates, and replace if cracked, carbon tracked, or damaged.

i. Inspect Ignition Primary Circuit.

Check the primary circuit resistance and visually inspect these wires for faulty insulation or poor connections. Replace and tighten connections as required.

j. Test Spark Intensity.

Determine if the spark from each spark plug wire will jump a 14 kilovolt gap setting (fig. 3).

If the spark is unsatisfactory at all spark plugs, trouble exists in the coil, condenser, rotor, rotor gap, or the primary circuit. Repair or replace as required.

If the spark is unsatisfactory at some but not all of the spark plug wires, the trouble is in the wire itself, the wire is not seated in the terminal plate, or the terminal plate is shorted. Repair or replace as required.

k. Test Engine Vacuum.

Check the engine manifold vacuum at engine idle speed (fig. 8). If the vacuum is lower than normal (18 to 21 inches Hg.), check more carefully for leakage at the vacuum lines, and intake manifold gasket, as outlined in par. q. below, and readjust the carburetor.

If the vacuum still is below normal, the engine is not operating at peak efficiency. Make the necessary corrections.

l. Inspect and Clean Fuel Pump.

Remove the fuel pump cover, clean the screen and upper body of the pump.

m. Test Fuel Pump Pressure.

Check the fuel pump pressure (fig. 6). If the pressure is not within specifications, remove and repair the pump. (If exchange pump is used, deduct .2 hr. from tune-up charge.).

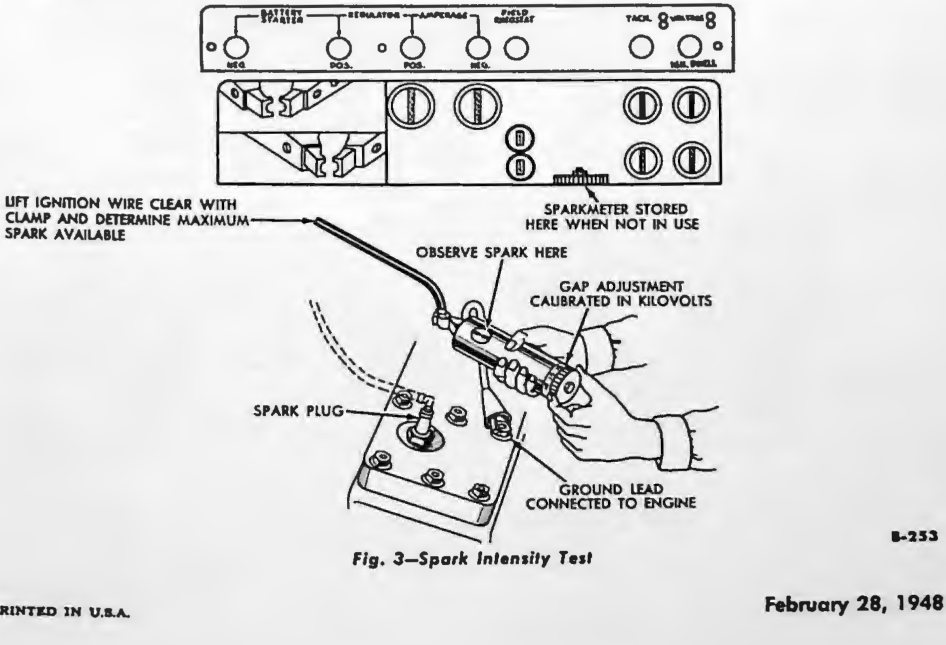

Fig. 3—Spark Intensity Test

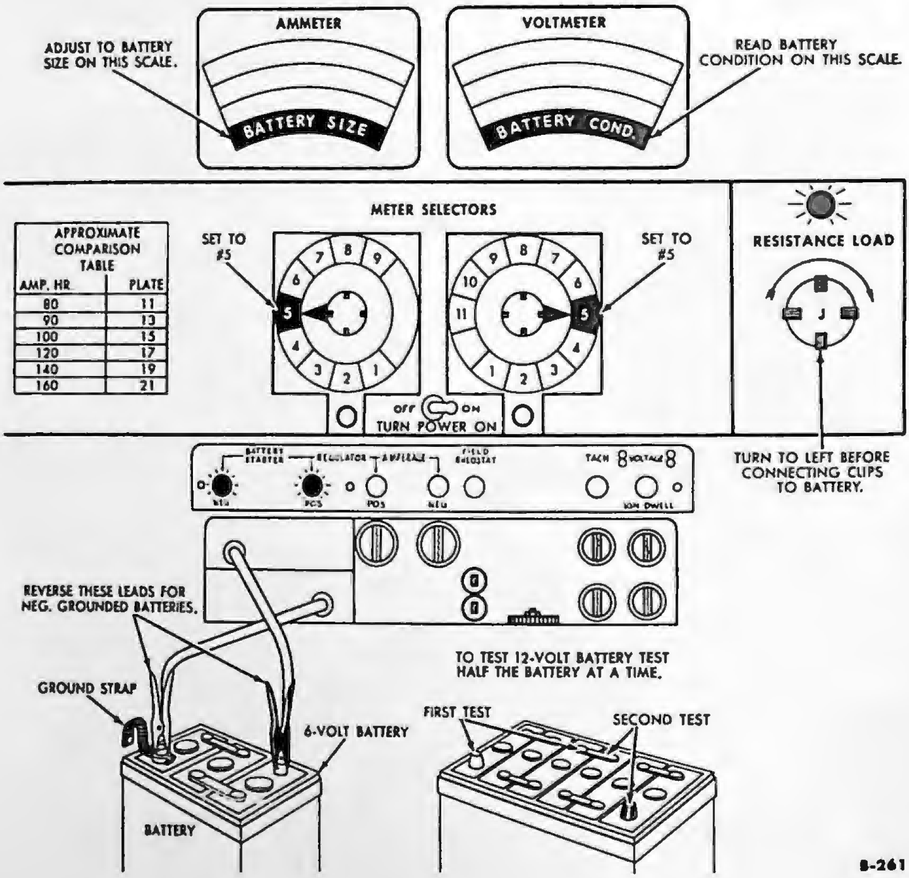

Fig. 4—Battery Test

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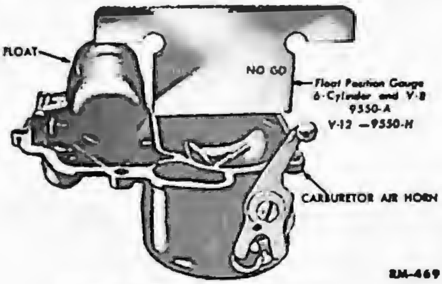

Fig. 5—Measuring Float Level

n. Test Fuel Pump Vacuum.

Check the fuel pump vacuum (fig. 6). If the vacuum is below 10 inches, or if the vacuum drops rapidly when the engine is stopped, repair as required. (If exchange pump is used, deduct .2 hr. from tune-up charge.)

o. Remove, Clean and Adjust Carburetor.

Remove, disassemble and clean the carburetor, including the carbon deposits from the throttle barrel.

NOTE: ***When thoroughly cleaned, the upper idle discharge hole is above the throttle plate.***

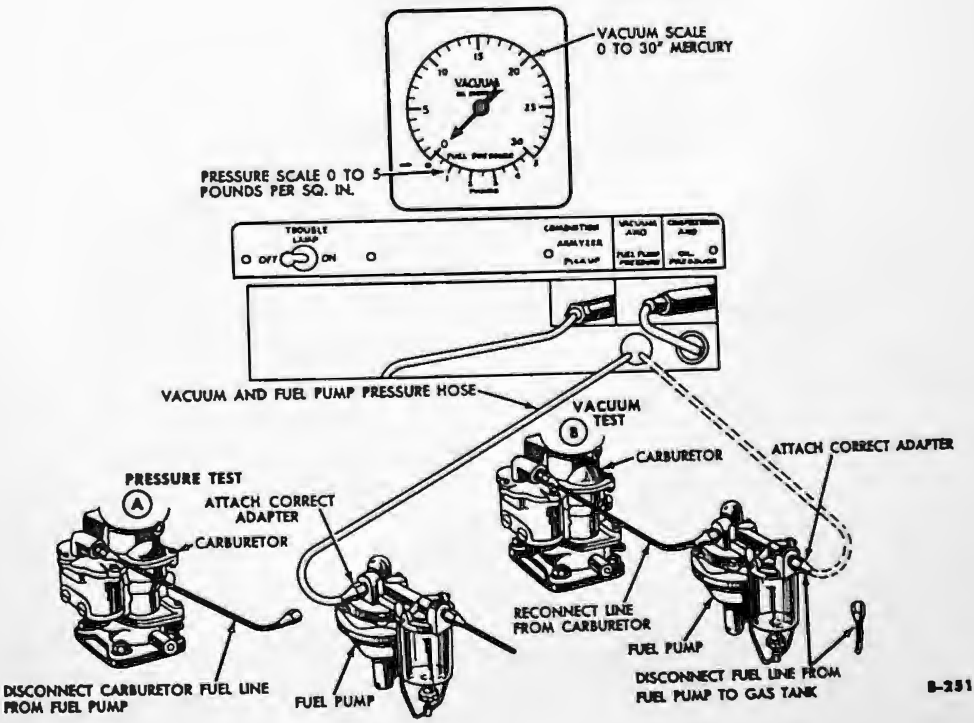

Fig. 6—Fuel Pump Pressure and Vacuum Tests

Make repairs and replacements as required. Set the float level (fig. 5), assemble the carburetor, and install. (If exchange carburetor is used, deduct .2 hr. from tune-up charge.)

p. Clean Air Cleaner.

Clean the air cleaner, remove obstructions, and re-install.

q. Adjust Carburetor Idle.

Connect vacuum gauge and correct any vacuum leaks at intake manifold, or windshield wiper, distributor, or power brake lines (extra charge is necessary to remove the manifold, or for work on power brake vacuum lines). Use the tachometer (fig. 7) (incorporated in the diagnosis test set) to set the idle speed at 500 R.P.M. Set the idle fuel adjustment to the point of highest engine R.P.M. Reset the idle speed adjustment to 500 R.P.M. if required.

NOTE: *If the mixture is too rich with the idle fuel adjustment all the way in, the throttle body is probably dirty (par. o above).*

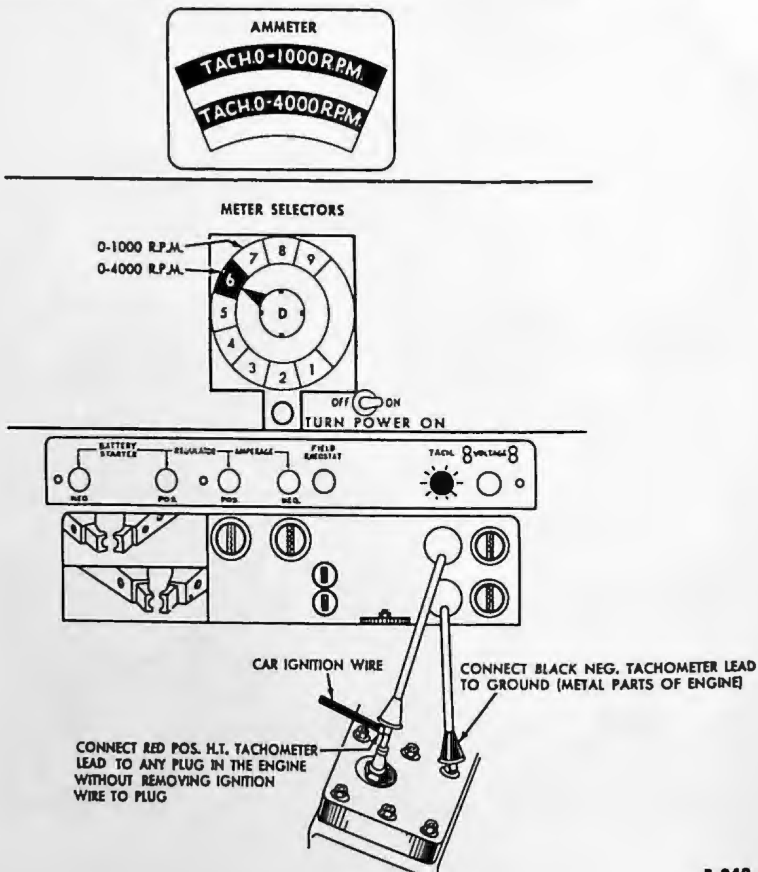

Fig. 7—Tachometer (Engine Speed)

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r. Analyze Engine Combustion.

Test the engine combustion air-fuel ratio and acceleration pump operation as a check on the work performed (fig. 1).

s. Road Test.

Road test the vehicle as a further check on work performed.

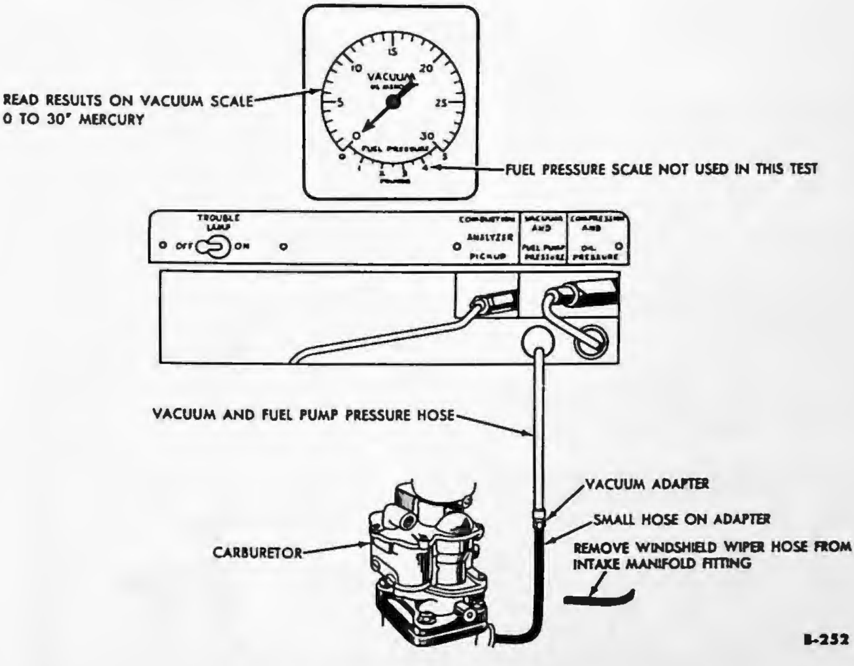

Fig. 8—Manifold Vacuum

Your dealership and service department are non-existent to the man who cannot bring his car in during the daytime if your service department is closed when he needs service.

HYDRAULIC VALVE LIFTERS

The Valve Lifters used in the Lincoln-Zephyr engine after 1938 and the Lincoln car after 1937 are the silent, self-adjusting type. The hydraulic unit within itself controls the clearance at the valve stem.

Oil is supplied to the groove in the valve lifter body from the regular engine lubricating system. (See Fig. 2.)

The oil pressure to the valve lifters is reduced by passing the oil through the metering hole at the point of entry into the auxiliary oil lines. This restriction in combination with the oil pressure regulator at the forward end of the valve chamber, reduces the pressure for proper operation of the lifters.

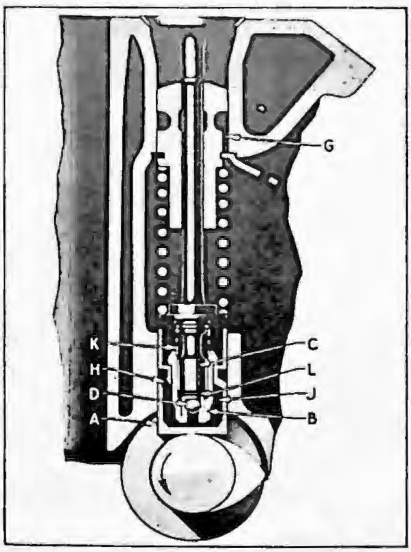

Fig. 1

Operation

The operation of the valve lifter is shown in Fig. 1. Oil under pressure from the lubricating system of the engine is supplied to the valve lifter auxiliary oil lines. This oil flows under pressure through hole "H" into the supply chamber "J."

With the face of the lifter on the heel of the cam and the valve seated, the plunger spring "K" lifts the hydraulic plunger "C" so that its upper end contacts the valve stem. As the plunger "C" moves upward, increasing the volume of pressure chamber "L", the ball check valve moves off its seat, and chamber "L" is filled with oil from supply chamber "J".

As the camshaft rotates, the cam pushes lifter body "A" upward, tending to decrease the volume of chamber "L" and forcing the ball check on to its seat. Further rotation of the camshaft moves the lifter body "A" upward, and the confined body of oil in chamber "L" acts as a member in the valve operating mechanism, the valve being lifted on a column of oil.

So long as the engine valve is off its seat, the load is carried by this column of oil. During this period a slight leakage of oil from chamber "L" occurs between the plunger "C" and the cyclinder "B." This leakage is necessary to eliminate any clearance between the valve seat on cylinder block, caused from contraction or expansion of the valve or lifter assembly. Any excess clearance from any cause is taken up by the plunger spring "K" pushing the plunger "C" upward against the valve stem. This upward movement of the plunger tends to create a vacuum in pressure chamber "L" which pulls the check ball from its seat, allowing an additional supply of oil to enter the pressure chamber. This cycle is repeated at each revolution of the cam.

Servicing

The complete hydraulic unit is interchange-

ABOVE APPLIES TO MODELS:

LINCOLN-ZEPHYR STARTING 1938
LINCOLN STARTING 1937

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April 16, 1941

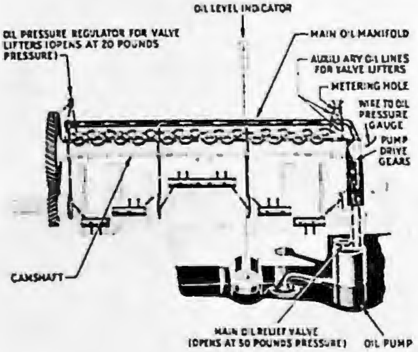

Fig. 2

able in the lifter body. However, the plunger in the cylinder of the hydraulic unit is not interchangeable. Mixing of the plungers is likely to cause improper operation because each plunger is a select fit to each cylinder at the time of manufacture.

Before replacing valve lifters in an engine after they have been removed for any reason all oil should be washed from them. Lifters will fill with oil, after engine is started, much quicker if they are free from oil film, thus allowing the air to escape quickly from the unit.

The following possible causes for trouble should then be checked:

1 Wash all oil from the unit. Use air pressure to dry.

2 Examine plunger to see that it is a free fit in cylinder and is not scored or pitted (slight scratches are not scores).

3 Make sure ball check is free on seat. Use a blunt tool through bottom hole in plunger to unseat ball.

ABOVE APPLIES TO MODELS:

LINCOLN-ZEPHYR STARTING 1938
LINCOLN STARTING 1937

4 Pull the plunger up to release the spring from the counterbore of the cylinder and raise the plunger in the cylinder as high as possible, and still leave it guided properly in the cylinder. Then push the plunger down quickly and release. If the unit holds air to the extent that there is a tendency of the plunger to rise when released, the unit is operative provided the plunger has not been interchanged with that from another cylinder, which would affect the correct clearance between the plunger and cylinder.

5 There should be .030 to .070" clearance between the valve stem and the top of the plunger, **measured with no oil in the hydraulic unit and with the plunger and plunger spring fully compressed.** A screwdriver can be used for compressing the plunger to make this check.

Test Procedure

Faulty lifters may be located without removing the lifter from the engine.

1 Run engine until oil is at normal operating temperature.

2 Remove intake manifold.

3 With bar type lifter, lift valve spring and stem and observe if the plunger in the hydraulic lifter follows the valve stem up, approximately $\frac{1}{16}$ in. Then let the valve stem down on the plunger and observe if the plunger still stays up. If it goes down in less than 30 seconds, this would indicate too much leak, either in the ball check or around the plunger. If the plunger fails to raise when the valve spring and stem is lifted, this would indicate the plunger is seized in the cylinder.

If the plunger is seized or leak back is too great, the unit should be removed and cleaned or replaced.

It is possible for a unit to be workable and still not follow up when the valve is lifted. This exception is due to carbon deposit at the top of the hydraulic cylinder which can be broken loose by putting a screw driver in the coil of the spring "K" on the plunger and twist the screw driver which will assist the spring, lift the plunger and loosen the carbon.

April 16, 1941

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Symptom 6999-A

Engine Does Not Develop Full Power

1. PRELIMINARY INSTRUCTIONS.

a. Preventive Maintenance.

So many factors can result in lack of power that it usually is advisable to recommend operation MA-1-B Preventive Maintenance and Lubrication Service which will eliminate much of the following procedure, or, in most cases, will correct the trouble. If the MA-1-B operation has supposedly been performed by someone else, or if it has not corrected the trouble, proceed as follows, omitting consideration of such factors as are known to be right.

b. Brakes and Tires.

Make sure that the brakes are not dragging and that the tires are inflated to the specified pressure.

c. Exhaust.

Make sure the exhaust tail pipe has not been bent or plugged with mud so as to cause restriction of the exhaust.

d. Wheel Alinement.

Observe the type of wear on the front tires to determine if the toe-in adjustment is incorrect and adjust the tie-rod if required.

e. Engine Oil.

New engine oil or too heavy oil will noticeably reduce the power of the engine, avoid changing oil unnecessarily. Don't change the oil just before making the following tests.

---

2. PROCEDURE.

a. Warm Up Engine.

Allow the engine to idle until normal operating temperature is reached, and follow whichever of the following conditions that apply.

(1) *IF THE VALVES ARE QUIET.* If the valves are quiet proceed with subparagraph b below.

(2) *IF VALVES ARE NOISY.* If, with the engine at normal operating temperature, the valves are noisy, either the valve action is sluggish or the spacing is too wide. Wide spacing usually has very little effect on the performance and since the spacing rarely increases in service, it usually can be assumed that the valve action is sluggish. If the valve action is sluggish with the engine idling, or if there is any evidence of sludge in the oil or if there are any indications of oil pumping or excessive carbon, disconnect the air cleaner and slowly pour ¼ pint of light, gum solvent oil into the carburetor throat. The engine speed will slow down as the oil is added. Don't pour the oil in so fast that the engine will stall. This oil will usually free up the valve action temporarily at least, and should reduce the valve noise. Add gum solvent to the engine oil (replace the engine oil after 300 miles with a detergent oil). NOTE: *Engines equipped with hydraulic valve lifters may have sluggish valves without noise.*

b. Check for Cylinders Missing at Idle Speed.

(1) *FOUR- OR SIX-CYLINDER ENGINES.* With the engine running, momentarily short out in turn each spark plug. If the shorting of one or several plugs has no effect on the running of the engine, those particular cylinders are missing. Follow the procedure in paragraph e below. If this does not correct the missing, follow the procedure in paragraph d below. If the miss is now corrected or if none of the cylinders were missing, proceed with "Test Vehicle On Hard Pull" (par. c below).

(2) *V-8 ENGINE.* Remove the two center spark plug wires at the one bank of cylinders and two end wires at the other bank. Bend these wires down so that the spark will jump to the cylinder head rather than to the plug. (This will short out every other cylinder in the firing order.) Run the engine on four cyl-

inders and test for missing cylinders as outlined for 4-cylinder engine in subparagraph (1) above. Repeat this entire procedure for the other four cylinders.

(3) *V-12 ENGINES.* Remove the primary low tension wire from one coil and run the engine on six cylinders and test for missing cylinders as outlined for a 6-cylinder engine in subparagraph (1) above. Repeat this entire procedure for the other six cylinders.

c. Test Vehicle on Hard Pull.

NOTE: *If, during the test, the engine fails to reach or maintain normal operating temperatures, the thermostat may not be operating, follow the procedure for the symptom "Engine Fails to Reach Normal Operating Temperature", Subject 8999*

Accelerate the engine rapidly from 7 to 15 miles per hour in high gear with the brakes partially applied. Follow whichever of the following conditions apply.

(1) *IF CLUTCH SLIPS UNDER LOAD.* If the clutch slips under load, adjust pedal free play or replace the clutch, whichever is required.

(2) *IF ENGINE BACKFIRES.* If the engine backfires through the carburetor when accelerated rapidly, it indicates the fuel mixture is too lean, follow the procedure for this symptom under Subject 9999. (Valves holding open or shorted ignition also are possible causes, however the test under paragraph 2 b will have determined if the valves or ignition are at fault.)

(3) *IF ENGINE DOES NOT PING (SPARK KNOCK).* If the engine does not ping, adjust the vacuum brake on the distributor to obtain a slight ping. Check the vacuum line to the distributor for air leakage or the line being clogged. If a slight ping cannot be obtained, time the ignition and check the spark advance (Opr. 12000-B).

(4) *IF ENGINE PINGS EXCESSIVELY.* If the engine pings excessively, adjust the vacuum brake on the distributor. If this does not correct the pinging, follow the procedure outlined in paragraph e below.

(5) *IF ENGINE PULLS EVENLY.* If the engine pulls evenly and there is no indication of late spark or excessive carbon, follow the "Fuel Mixture Too Lean" symptom, Subject 9999.

(6) *IF ENGINE PULLS UNEVENLY.* If the engine pulls unevenly, proceed, starting with paragraph d below.

d. Test Spark at Spark Plug Wires.

Run the engine at idle speed. Remove the wire from No. 1 spark plug and hold the wire terminal $\frac{3}{16}$-inch from the cylinder head and observe if the spark jumps the gap regularly without missing. Make this test at each spark plug wire. Follow whichever of the following conditions apply.

(1) *SATISFACTORY SPARK FROM ALL WIRES.* If a satisfactory spark from all wires is obtained, proceed with subparagraph e below.

(2) *SATISFACTORY SPARK FROM SOME BUT NOT ALL WIRES.* If a satisfactory spark is obtained from some wires and not from others, follow the procedure for this symptom under Subject 12999.

(3) *UNSATISFACTORY SPARK FROM ALL WIRES.* If a satisfactory spark is not obtained from any of the wires, perform Operation 12000-B.

(4) *IRREGULAR SPARK FROM ALL WIRES.* If an irregular spark is obtained from all wires follow the procedure for this symptom under Subject 12999.

e. Clean and Space or Replace Spark Plugs and Test Compression.

Clean and space or replace the spark plugs. Before reinstalling the plugs, test the compression of each cylinder, (Opr. 6050-A). Follow whichever of the following conditions that apply.

(1) *NORMAL COMPRESSION.* If the compression is normal, time the ignition and check the governor advance (Opr. 12000-B).

(2) *ABOVE NORMAL COMPRESSION.* If the compression of any cylinder is above normal, remove the carbon from the compression chamber, and while the heads are removed make sure that the valve stems are not gummy.

(3) *BELOW NORMAL COMPRESSION.* If the compression from any cylinder is below normal, remove the cylinder heads and make necessary repairs to valves, cylinders or pistons.

f. Repeat Test on Hard Pull.

Repeat the test of the engine on a hard pull (par. c above). If engine now pulls unevenly or still lacks power, the fuel mixture is probably lean. Follow the procedure for the symptom "Fuel Mixture is Too Lean", Subject 9999.

g. Time Ignition and Check Governor Advance.

If the above procedure has not corrected the trouble and if this operation has not already been performed, time the ignition and check the governor advance (Opr. 12000-B).

h. Check Fuel Mixture.

If the above inspections and tests do not locate the cause for lack of power, the trouble probably is a lean fuel mixture, follow the procedure outlined for this symptom under Subject 9999. If this has not corrected the trouble, see paragraph 3 below.

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3. ADDITIONAL POSSIBLE CAUSES.

The above procedure will correct a lack of power in nearly every case, however, several other unlikely conditions are possible and, if the trouble still is not corrected, one of the following may be the cause.

(1) *BRAKES DRAGGING WHEN HOT.* Make sure that the brake pedal has necessary free travel and that the brake master cylinder vent is not obstructed.

(2) *HAND BRAKE DRAGGING.* Owner may not have been releasing hand brake fully.

(3) *EXCESSIVE EXHAUST BACK PRESSURE.* If it is suspected that there is excessive exhaust back pressure due to clogged muffler, sticking exhaust thermostat, clogged or bent tail pipe, etc., make the test outlined in paragraph c above with exhaust disconnected during the test.

(4) *CAMSHAFT OUT OF TIME.* Camshaft out of time if either gear has been replaced, major repairs have just been made, or if the main bearings have been replaced, the crankshaft may have been dropped low enough to get the gears out of time. Remove the gear cover to inspect.

(5) *TOO LITTLE VALVE CLEARANCE.* Too little valve clearance resulting in valves not completely closing when hot (does not apply with hydraulic lifters). Remove the valve chamber cover to inspect.

(6) *TOO MUCH VALVE CLEARANCE.* Too much valve clearance resulting in valves opening late and closing early (does not apply with hydraulic lifters). Remove valve chamber cover to inspect.

(7) *ENGINE TIGHTNESS.* Wrong size parts may have been installed. This is particularly true if piston rings have been installed without sufficient gap.

(8) *VALVES STICKING.* It is possible for the valve action to be sluggish during operation and not show up as noisy during idle.

Symptom 6999-B
Top Speed Too Low

1. TOP SPEED CHARACTERISTICS (Passenger Cars).

Engine	Year	Axle Ratio	Top Speed
60 H.P.	1937-40	4.44	76.0
85 H.P.	1932	4.11	73.5
85 H.P.	1934	4.11	83.8
85 H.P.	1935-36	4.11	84.5
85 H.P.	1937-40	3.78	85.6
90 H.P. (V-8)	1941-42	3.78	86.6
90 H.P. (6-Cyl.)	1941-42	3.78	84.0
95 H.P.	1939-40	3.54	88.0
100 H.P.	1941-42	3.54	88.0

Engine	Year	Axle Ratio	Top Speed
110 H.P.	1936-37	4.33	90.0
110 H.P.	1938-39	4.44	90.0
120 H.P.	1940-41	4.44	92.0
130 H.P.	1942	4.22	90.0

Top speed in miles per hour with the standard axle ratio for each of the various models, with two passengers, at sea level are as indicated above. If the vehicle delivers the top speed as shown, it is normal and little can be gained by trouble shooting.

2. PRELIMINARY INSTRUCTIONS.

a. Tightness

If the engine has just received major repairs, it may be tight and the top speed will be reduced until the new parts are worn in.

b. Engine Oil.

Do not change oil just before testing a car for top speed as new oil will reduce power and top speed.

c. Standard Equipment.

Make sure the vehicle is equipped with the correct tire size, correct axle ratio, correct speedometer gear ratio and the correct cylinder heads.

d. Tires.

Inflate tires to the specified pressure.

3. CORRECTION PROCEDURE.

All of the conditions that result in loss of power likewise reduce top speed. Follow the entire procedure given for the sypmtom "Engine Does Not Develop Full Power". If this does not correct the trouble, perform Operation 12000-B (if this has not already been done) plus the procedure outlined under the symptom "Fuel Mixture Too Lean", Subject 9999.

Symptom 6999-C

Acceleration Too Low

1. ACCELERATION DATA.

Engine	Year	Axle Ratio	Seconds Required 7 MPH to 25 MPH	Seconds Required 10 MPH to 60 MPH
60 H.P.	1937-40	4.44	9.5	31.0
85 H.P.	1932-33	4.11	7.0	23.0
85 H.P.	1934	4.11	6.5	17.5
85 H.P.	1935-36	4.11	7.0	20.5
85 H.P.	1937-40	3.78	7.5	23.0
90 H.P. (V-8)	1941	3.78	9.8	26.1
90 H.P. (V-8)	1942	3.78	9.1	23.0
90 H.P. (6-Cyl.)	1941	3.78	8.5	24.3
90 H.P. (6-Cyl.)	1942	3.78	10.0	28.0
95 H.P.	1939-40	3.54	7.6	23.0
100 H.P.	1941	3.54	9.9	26.0
100 H.P.	1942	3.54	8.9	22.0
110 H.P.	1936-37	4.33	7.0	21.5
110 H.P.	1937	4.44	6.4	19.5
110 H.P.	1938	4.44	6.6	21.9
110 H.P.	1939	4.44	7.2	20.4
120 H.P.	1940-41	4.44	5.5	17.7
130 H.P.	1942	4.22	7.0	21.7

Normal acceleration rate in seconds in high gear with the standard axle ratio for each of the passenger cars, with two passengers, at sea level is as indicated above. Some variations are to be expected at high elevations. Atmospheric conditions, likewise are a factor and the results obtained will be affected by air temperature and pressure.

2. TESTING INSTRUCTIONS.

a. Procedure.

(1) Select strip of straight, smooth and dry pavement for the test.

(2) With the car traveling 7 miles per hour in high gear, press the accelerator all the way down, noting the number of seconds required to reach 25 miles per hour.

(3) Check the acceleration starting at 10 miles per hour in high gear, noting the number of seconds required to reach 60 miles per hour.

(4) Repeat the tests, going the opposite direction, and use the average time so as to compensate for the wind.

3. CORRECTION PROCEDURE.

Follow the preliminary instructions and testing procedure under the symptom "Engine Does Not Develop Full Power", as the conditions which result in the engine not delivering full power will also affect acceleration.

Symptom 6999-D

Engine Cranks But Will Not Start

1. PROCEDURE.

a. Preliminary Instructions.

Make certain the ignition switch is ON and that there is fuel in the fuel tank, and follow the procedure given below for whichever of the conditions that apply.

(1) *IF ENGINE IS WET*. If the engine is wet, wipe all moisture from the distributor caps, coil, spark plugs, and spark plug wires.

(2) *IF ENGINE IS HOT*. If the engine is hot, hold the foot throttle open, and crank the engine. This clears away vapor lock which may be present.

(3) *IF ENGINE IS FLOODED*. If the engine is flooded (due to either repeated attempts to start while the carburetor was choked, or to over manipulation of the foot throttle and accelerating pump), push the choke button IN and pull the hand throttle button OUT to its stop. Crank the engine several revolutions to exhaust the surplus fuel.

(4) *IF ENGINE IS EXTREMELY COLD*. If the engine is extremely cold, make certain that the choke is working and pull the choke button out to the stop. Hold the clutch pedal down. With the ignition switch ON, press the starter button.

(5) *IF ENGINE CRANKS SLOWLY*. If the engine cranks slowly, make sure the battery is not partially discharged and that the viscosity of the engine oil is correct for the prevailing temperature. If the cranking speed is still slow, follow the procedure under the symptom "Slow Cranking Speed", Subject 11999. If this has not corrected the trouble, proceed as follows.

(6) *IF ENGINE STILL FAILS TO START*. If the engine still fails to start after the above procedures have been followed, proceed with the procedures below in the order given until the trouble has been corrected.

b. Determine If Fuel is Being Delivered to Carburetor.

(1) *V-8, V-12, AND 4-CYLINDER ENGINES*. On the V-8, V-12, and 4-cylinder engines, remove a drain plug from the carburetor float chamber. If gasoline runs from the drain, it indicates fuel is being delivered to the carburetor.

(2) *SIX-CYLINDER ENGINE*. On the six-cylinder, remove the carburetor air cleaner and observe if a spray of gasoline is coming from the accelerator pump spray nozzle (located inside the air throat of the carburetor) each time the throttle is opened fully. If a spray is observed, it indicates fuel is being delivered to the carburetor.

(3) *IF NO GASOLINE IS OBSERVED*. If no gasoline is observed at the drain on the V-8 or 4-cylinder carburetor or at the pump discharge nozzle on the 6-cylinder carburetor, fuel is not reaching the carburetor, follow

procedure under "Fuel is Not Reaching The Carburetor", Subject 9999.

c. **Determine If Current is Being Delivered to Spark Plugs.**

Turn the ignition switch ON. Remove the wire from any spark plug and hold the wire terminal 3/16-inch from the cylinder head while the engine is being cranked. If a spark does not jump this gap, the ignition is at fault, follow the procedure under the symptom that applies (Subject 12999).

Symptom 6999-E

Engine Backfires But Will Not Start

1. **PRELIMINARY INSTRUCTIONS.**

This symptom indicates that the spark plugs are not firing in their proper order, either due to the ignition high tension system being shorted, the spark plug wires being transposed, or the camshaft out of time. Perform the following operations in the order given.

2. **PROCEDURE.**

Wipe all dust and moisture from the exterior of the distributor, coil, spark plugs, and spark plug wires and again attempt to start the engine. If the engine still fails to start, make sure each spark plug wire is attached to the correct spark plug. Make sure the spark plug wires are installed at the correct terminals of the distributor cap or terminal plate and that the interior of the distributor is not wet. Replace the distributor cap or terminal plates if there is evidence of their being shorted. If the above procedure has not corrected the trouble, the camshaft probably is out of time, remove the engine front cover and correct the camshaft timing.

Symptom 6999-F

Engine Runs Unevenly and Backfires Through Carburetor

1. **PRELIMINARY.**

a. **If the engine is cold.**

If the engine is cold, the carburetor may need further choking until the engine is warmed up.

2. **PROCEDURE.**

a. **Check Spark Plug Wires and Distributor Plates.**

Check to determine if the spark plug wires are attached to the spark plugs and the distributor cap or terminal plates in their proper firing order. Replace the distributor cap or terminal plates if they are cracked or shorted. If the ignition is found not to be at fault, follow the procedure for the symptom "Fuel Mixture Too Lean", Subject 9999.

3. **ADDITIONAL POSSIBLE CAUSES.**

a. **Test Engine Compression.**

Test the compression of each cylinder and make the necessary corrections.

b. **Check for Sticking Valves.**

NOTE: *This does not apply to engines equipped with hydraulic valve lifters. Remove the valve chamber cover to check valve action.*

Run the engine at idle speed and observe if any of the valves are noticeably noisy. Abnormally noisy valves indicate sluggish action. Make the necessary corrections to the valves.

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Symptom 6999-G

Engine Starts But Fails To Keep Running

1. PROCEDURE.

a. Most Probable Cause.

If the engine starts and stops after a short period of running and cannot again be started, fuel is not reaching the carburetor, follow the procedure under the symptom "Fuel is Not Reaching the Carburetor", Subject 9999.

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2. ADDITIONAL POSSIBLE CAUSES.

In rare cases the ignition coil or condenser will allow the engine to start but will fail to deliver a spark when hot. Turn the ignition switch ON. Remove the wire from any spark plug and hold the wire terminal 3/16-inch from the cylinder head while being cranked. If the spark does not jump the gap, remove the distributor and perform Operation 12000-B.

Symptom 6999-H

Engine Misfires At High Speed

1. PROCEDURE.

a. Check Distributor and Coil.

Remove the distributor and follow Operation 12000-B procedure.

b. Check Fuel System.

Follow the procedure for the symptom "Fuel Mixture Is Too Lean", Subject 9999.

c. Check for Sticking Valves.

NOTE: *This test does not apply to engines equipped with hydraulic valve lifters. On these vehicles remove the valve chamber cover to check the valve action.*

Run the engine at idle speed at normal operating temperature and observe if any of the valves are noticeably noisy. Abnormally noisy valves indicate sluggish valve action. Make the necessary corrections to the valves.

Symptom 6999-I

Engine Misfires On Fast Acceleration Or Hard Pull

1. PROCEDURE.

a. Test Spark at Spark Plug Wires.

Run the engine at idle speed. Remove the wire from No. 1 spark plug and hold it 3/16-inch from the cylinder head and observe if the spark jumps regularly without missing. Make this test at each spark plug wire. If a satisfactory spark is obtained from each spark plug wire, proceed with subparagraph b below. If an unsatisfactory spark or no spark is obtained at any of the wires, follow the procedure given for whichever symptom applies (Subject 12999).

b. Clean, Space or Replace Spark Plugs.

Clean and space spark plugs or replace damaged or faulty plugs. NOTE: *It may be advisable to check the engine compression while the spark plugs are removed to avoid again removing the spark plugs later.*

c. Check Accelerating Pump Action.

Make sure the accelerating pump link is in the proper hole for the prevailing temperature. Remove the air cleaner and observe if a spray of gasoline comes from the pump discharge nozzle (located inside of the carburetor air throat) each time the throttle is opened fully. Repair or replace the carburetor if no spray or a very light spray is observed (carburetor pump mechanism or check valve is faulty).

d. Check Float Level and Clean Carburetor.

Remove and clean the carburetor thoroughly. Reset the float level if required. (Refer to carburetor specifications for the correct float setting).

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2. ADDITIONAL POSSIBLE CAUSE.

a. Loss of Compression.

Test the compression of each cylinder and make corrections as required. Run the engine at idle speed and observe if any of the valves are noticeably noisy. Abnormally noisy valves (except on engines equipped with hydraulic valve lifters) indicate sluggish valve action. Make the necessary correction to the valves.

Diagnose Don't Guess

May 25, 1945

Fits, Tolerances, and Wear Limits

The cluster gear determines the characteristics of the transmission regardless of any differences in the transmission case, and for this reason the following transmission specifications are keyed to the countershaft cluster gear. When in doubt as to model car or truck transmission in which the cluster gear is used, consult the parts book.

All transmissions with helical gears, except 70-7113-B, have a synchronizer for high and second speed gears.

	Lubricant Capacity (Pints)
Passenger Cars through 1948	$2\frac{3}{4}$
Lincoln Overdrive through 1948	1
Ford Passenger Car—Standard	4
Overdrive	$4\frac{1}{2}$
Mercury—Standard and Overdrive	$3\frac{1}{2}$
Lincoln—Standard and Overdrive	$3\frac{1}{2}$
Truck Transmissions—Light 3-speed	$2\frac{3}{4}$
Heavy 3-speed	6
4-speed	5
5-speed	12

7000—TRANSMISSION

Countershaft Cluster Gear Part Number	Type of Gears		Speeds Forward	Gear Ratios					
	Second Speed	Forward and Reverse Speeds		First (Low)	Second	Third (High)	Fourth	Fifth	Reverse
B-7113	Spur	Spur	4	6.4	3.09	1.69	1.0	—	7.82
BB-7113-A	Spur	Spur	4	6.4	3.09	1.69	1.0	—	7.82
67-7113-A	Helical	Spur	3	3.52	1.899	1.0	—	—	4.003
68-7113-A	Helical	Helical	3	2.82	1.604	1.0	—	—	3.62
70-7113-B	Helical	Spur	3	3.71	1.83	1.0	—	—	4.59
70-7113-C	Spur	Spur	4	6.4	3.09	1.69	1.0	—	7.82
74-7113-A	Helical	Spur	3	3.07	1.765	1.0	—	—	4.01
74-7113-D	Helical	Helical	3	3.07	1.83	1.0	—	—	4.01
09B-7113	Spur	Spur	4	6.4	3.09	1.69	1.0	—	7.82
022A-7113-A	Helical	Helical	3	3.11	1.77	1.0	—	—	4.00
21C-7113	Helical	Helical	3	3.11	1.77	1.0	—	—	4.00
29AS-7113	Helical	Helical	3	2.57	1.83	1.0	—	—	3.48
06H-7113	Helical	Helical	3	2.33	1.577	1.0	—	—	3.00
26H-7113	Helical	Helical	3	2.12	1.43	1.0	—	—	2.72
48-7113	Helical	Spur	3	2.82	1.60	1.0	—	—	3.38
8D-7113	Helical	Spur	3	3.714	1.871	1.0	—	—	4.588
8M-7113	Helical	Helical	3	2.819	1.604	1.0	—	—	3.625
8A-7113	Helical	Helical	3	2.82	1.604	1.0	—	—	3.62
7EQ-7113	Spur	Spur & Helical	5	6.06	3.50	1.80	1.0	0.799	6.00
7EQH-7113	Spur	Spur & Helical	5	7.58	4.38	2.40	1.48	1.0	7.51
*7177									
*7144									
*7137									

*7EQ and 7EQH Cluster Gears.

7017—MAIN DRIVE GEAR

Part Number	Mfg. Gear End Inside Diameter (Inches)	Wear Limit Gear End Inside Diameter (Inches)
BB-7017-A	1.312–1.313	1.316
BB-7017-B	1.312–1.313	1.316
48-7017	1.126–1.127	1.130
67-7017	1.126–1.127	1.130
70-7017-A	1.1997–1.2007	1.2040
70-7017-B	1.1997–1.2007	1.2040
74-7017	0.938–0.939	0.942
81A-7017	1.126–1.127	1.130
96H-7017	1.126–1.127	1.130
06H-7017	1.126–1.127	1.130
26H-7017-A	1.126–1.127	1.130
022A-7017	1.126–1.127	1.130
11Y-7017	1.126–1.127	1.130
29AS-7017	1.2002–1.2007	1.203
7EQ-7017	1.625–1.626	1.629
7EQH-7017	1.625–1.626	1.629
8D-7017	1.4365–1.4370	1.440
8A-7017	1.3781–1.3786	1.3816

7061—TRANSMISSION MAIN SHAFT

Part Number	Mfg. Pilot Diameter (Inches)	Wear Limit Pilot Diameter (Inches)
B-7061	0.749–0.750	0.745
BB-7061	0.8110–0.8115	0.806
68-7061-B	0.749–0.750	0.745
70-7061-B	0.7631–0.7636	0.758
74-7061-B	0.624–0.625	0.620
81A-7061	0.7500–0.7505	0.745
01T-7061-A1	0.8110–0.8115	0.806
01T-7061-A2	0.8110–0.8115	0.806
09B-7061-A	0.9990–0.9995	0.994
09B-7061-B	0.9990–0.9995	0.994
11Y-7061	0.7500–0.7505	0.745
21C-7061-A	0.7500–0.7505	0.745
21C-7061-B	0.7500–0.7505	0.745
29AS-7061	0.7632–0.7627	0.758
16H-7061	0.7500–0.7505	0.745
8A-7061-A	0.8312–0.8317	
8A-7061-B	0.8312–0.8317	0.8272
59C-7061	0.7500–0.7505	0.7460
8D-7061	0.9700–0.9705	0.9660
7EQ-7061	1.1245–1.125	0.1205
8M-7061	0.7500–0.7505	0.7460

7069-7173—INTERMEDIATE GEAR THRUST WASHER (FRONT)

Part Number	Mfg. Thickness (Inches)	Wear Limit Thickness (Inches)
B-7069	0.183–0.184	0.179
70-7069	0.1853–0.1865	0.1815
74-7069	0.140–0.141	0.136
81A-7069-A	0.0630–0.0655	0.060
81A-7069-B	0.068–0.071	0.066
7EQ-7173-A	0.119–0.121	0.115
7EQ-7173-B	0.123–0.125	0.119
7EQ-7173-C	0.115–0.117	0.111
7EQH-7173-A	0.119–0.121	0.115
7EQH-7173-B	0.123–0.125	0.119
7EQH-7173-C	0.115–0.117	0.111

7071-7117—INTERMEDIATE GEAR THRUST WASHER (REAR)

Part Number	Mfg. Thickness (Inches)	Wear Limit Thickness (Inches)
68-7071	0.1875	0.1825
74-7071-B	0.140–0.141	0.136
81A-7071	0.184–0.185	0.179
7EQ-7117	0.119–0.121	0.115

7182—INTERMEDIATE GEAR THRUST WASHER (CENTER)

Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)
7EQ-7182	0.119–0.121	0.115

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7102-7103-7158-7196—INTERMEDIATE GEAR

Part Number	Mfg. Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)	Mfg. End Play (Inches)	Wear Limit End Play (Inches)
06H-7102	1.3760–1.3765	1.382	0.004–0.008	0.020
B-7103	1.5575–1.5580	1.5630	0.004–0.008	0.020
74-7103-B	1.3760–1.3765	1.382	0.004–0.008	0.020
09B-7103	1.6870–1.6875	1.692	0.004–0.008	0.020
51A-7102	1.3760–1.3765	1.3820	0.003–0.011	0.023
8D-7102	1.5020–1.5025	1.5080		
7EQ-7158	2.0287–2.0297	1.0347	0.004–0.010	0.022
7EQH-7158	2.4025–2.4030	2.4080	0.004–0.010	0.022
7EQ-7196	2.2825–2.2830	2.2880	0.004–0.013	0.025
7EQH-7196	2.2825–2.2830	2.2880	0.004–0.013	0.025

7111-7113—COUNTERSHAFT

Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)	Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)
B-7111	0.7495–0.7500	0.7445	8A-7111-B	0.7495–0.7500	0.7445
51-7111	0.9995–1.0000	0.9945	7EQ-7113	1.7318–1.7323	1.7268
74-7111	0.6245–0.6250	0.6205	8D-7111	0.9995–1.0000	0.9945
19B-7111	0.9990–0.9995	0.998			
29AS-7111	0.7545–0.7550	0.7535			

7113—COUNTERSHAFT CLUSTER GEAR

Part Number	End Play (Inches)		Inside Diameter (Inches)	
	Mfg.	Wear Limit	Mfg.	Wear Limit
B-7113	0.004–0.012	0.025	1.125–1.126	1.130
BB-7113-A	0.009–0.021	0.025	1.6255–1.6265	1.630
67-7113-A	0.005–0.017	0.025	1.125–1.126	1.130
68-7113-A	0.005–0.017	0.025	1.125–1.126	1.130
70-7113-B	0.004–0.012	0.025	1.6255–1.6265	1.630
70-7113-C	0.004–0.012	0.025	1.6255–1.6265	1.630
74-7113-A	0.005–0.017	0.025	0.760–0.761	0.765
74-7113-D	0.005–0.017	0.025	0.760–0.761	0.765
09B-7113	0.004–0.012	0.025	1.7495–1.7505	1.753
022A-7113-A	0.005–0.017	0.025	1.125–1.126	1.130
21C-7113	0.005–0.017	0.025	1.125–1.126	1.130
29AS-7113	0.005–0.017	0.025	1.0055–1.0065	1.009
06H-7113	0.005–0.017	0.025	1.125–1.126	1.130
26H-7113	0.005–0.017	0.025	1.125–1.126	1.130
48-7113	0.005–0.017	0.025	1.125–1.126	1.130
8D-7113	0.006–0.020	0.028	1.6255–1.6265	1.632
8M-7113	0.0045–0.0185	0.0265	1.125–1.126	1.631
8A-7113	0.0045–0.0185	0.0265		
51A-7113	0.0045–0.0185	0.0265		

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7119-7128-7129—COUNTERSHAFT GEAR THRUST WASHER

Part Number	Thrust Washer Mfg. Thickness (Inches)	Thrust Washer Wear Limit Thickness (Inches)	Part Number	Thrust Washer Mfg. Thickness (Inches)	Thrust Washer Wear Limit Thickness (Inches)
B-7119-A1 & A2	0.0615–0.0635	0.0565	59T-7129-A	0.113–0.115	0.109
70-7119	0.0615–0.0635	0.0565	26H-7129	0.114–0.115	0.109
74-7119	0.0615–0.0635	0.0565	7EQ-7119	0.0897	0.0847
29AS-7119	0.0615–0.0635	0.0565	8D-7119	0.0615–0.0635	0.0565
B-7129	0.114–0.115	0.109	8D-7128	0.040–0.042	0.035
68-7129-B	0.114–0.115	0.109	8M-7128	0.0615–0.0635	0.0565
74-7129-C	0.180–0.182	0.175	8D-7129	0.0615–0.0635	0.0565
29AS-7129	0.114–0.115	0.109	8M-7129	0.138–0.140	0.153

7118-7121—COUNTERSHAFT GEAR BEARING

Part Number	Mfg. Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)	Mfg. Outside Diameter (Inches)	Wear Limit Outside Diameter (Inches)
74-7121-B	0.626–0.627	0.629	0.758–0.759	0.757
8D-7121	1.0005–1.0015	1.0065	1.624–1.625	
B-7118	1.0005–1.0015	1.0065		
B-7118-A3	1.0005–1.0015	1.0065		
B-7118-A4	1.0005–1.0015	1.0065		
B-7121-A3	0.7505–0.7515	0.7565	1.1255–1.1265	
BB-7118-A	1.0005–1.0015	1.0065	1.624–1.625	
7EQ-7118	1.7326–1.7330			

7140—REVERSE IDLER GEAR SHAFT

Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)
B-7140-A	0.7490–0.7495	0.748
BB-7140	0.9872–0.9877	0.986
70-7140	0.9872–0.9877	0.986
74-7140-A	0.6245–0.6250	0.623
09B-7140	0.9995–1.0000	0.998
29AS-7140	0.7545–0.7550	0.753
7EQ-7140	1.124–1.125	1.125
8D-7140	0.9872–0.9877	0.9857

7141-7142—REVERSE IDLER GEAR

Part Number	Mfg. Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)
B-7141	0.7515–0.7525	0.7535
BB-7141	0.9890–0.9900	0.991
68-7141	0.7515–0.7525	0.7535
70-7141-B	0.9775–0.9785	0.9795
74-7141-B	0.627–0.628	0.629
29AS-7141	0.7563–0.7570	0.758
09B-7141	1.0020–1.0025	1.0035
8D-7141	0.9920–0.9930	0.9940
7EQ-7142	1.625–1.626	1.627

June 10, 1948

7550—CLUTCH DISK

Part Number	Facing Thickness (Inches)	Facing Diameter (Inches)	Spline Fit Wear Limit (Inches)	Disk Runout (Inches)
B-7550	0.135	9	0.002	0.000–0.025
74-7550	0.1235	8.5	0.002	0.000–0.025
81T-7550	0.137	11	0.002	0.000–0.035
81B-7550	0.137	11	0.002	0.000–0.035
19B-7550	0.137	11	0.002	0.000–0.035
29A-7550	0.125	10	0.002	0.000–0.035
19A-7550	0.125	10	0.002	0.000–0.035
91A-7550	0.125	9	0.002	0.000–0.035
11A-7550	0.125	9	0.002	0.000–0.035
29AS-7550	0.125	9	0.002	0.000–0.035
96H-7550	0.140	10	0.002	0.000–0.035
26H-7550	0.125	10	0.002	0.000–0.035
51A-7550	0.125	10	0.002	0.000–0.035
59T-7550-A	0.137	11	0.002	0.000–0.035
59T-7550-B	0.137	11	0.002	0.000–0.035
7EQ-7550-B	0.137	12	0.002	0.000–0.035
8A-7550-A1-2	0.125	9.5	0.002	0.000–0.035
8CM-7550	0.125	10	0.002	0.000–0.035

7563—CLUTCH PRESSURE PLATE

Part Number	No. of Spgs.	Diameter (In.)	Spg. Load Mfrs. Dimensions (Ft.-Lb.)	Spring Color	Wear Limit (Ft.-Lb.)	Pedal Free Travel (In.)
B-7563-B	12	9	—	—	—	0.75–1.0
BB-7563	12	9	110-120	Gray	110	0.75–1.0
			120-130	Orange	120	0.75–1.0
74-7563	6	9	135-140	Blue	135	0.75–1.0
09A-7563	6	9	147-153	Brown	147	1.5 –1.75
09B-7563	9	11	115-120	Gray	115	1.5 –1.75
29AS-7563	6	9	147-153	Brown	147	1.0 –1.25
19A-7563	9	10	115-120	Gray	115	1.0 –1.25
51-7563	9	11	115-120	Gray	115	1.5 –1.75
81B-7563	9	11	115-120	Gray	115	1.5 –1.75
96H-7563	9	11	115-120	Gray	115	1.5 –2.0
26H-7563	9	11	115-120	Gray	115	1.5 –2.0
7EQ-7563-B	12	12	125-135	Light Blue	125	1.5 –1.75
8A-7563	6	9.5	175	Green	175	1.0 –1.25
8CM-7563	9	10	150-160	—	150	1.0 –1.25

7652—OVERDRIVE MAIN SHAFT

Part Number	Mfg. Maximum Inside Diameter Overrunning Clutch Race (Inches)	Wear Limit Inside Diameter Overrunning Clutch Race (Inches)
16H-7652	2.6255	2.6295
8A-7652	2.6255	2.6295
8M-7652	2.6255	2.6295

7659-7660—OVERDRIVE ADAPTER

Part Number	Mfg. Maximum Inside Diameter Gear Plate Race (Inches)	Wear Limit (Inches)
16H-7659	3.250	3.254
8A-7660	3.250	3.254

7662—OVERDRIVE BALK RING AND GEAR PLATE ASSEMBLY

Part Number	Mfg. Maximum Diameter (Inches)	Wear Limit Diameter (Inches)	Balk Ring Tension (Pounds Pull)
16H-7662	3.246	3.242	3.5–5.5
56H-7662	3.232	3.228	3.5–5.5

7670—OVERDRIVE SUN GEAR

Part Number	Mfg. Maximum Inside Diameter (Inches)	Wear Limit Inside Diameter (Inches)
56H-7670	1.0785	1.0815
56H-7670	1.0785	1.0815

7685—OVERDRIVE SHIFT FORK AND RAIL ASSEMBLY SPRING

Part Number	Mfg. Free Length (Inches)
16H-7685	2.750

There is no question as to whether or not any car needs to be prepared for winter in locations where freezing weather is encountered. *They all must be prepared for winter.* It is merely a question of whether you or someone else does the work, and whether the work is all done at one time, or piecemeal.

June 10, 1948

MERCURY LIQUAMATIC DRIVE

Starting with the 1942 models a "Liquamatic" drive was adopted as optional equipment on Mercury cars.

The liquamatic drive consists of a liquid coupling in place of the conventional flywheel and an automatic transmission.

The liquid in the flywheel is S.A.E. 10 W oil in all seasons and localities. It should never be necessary to change this oil.

Two marks are provided on the flywheel housing as shown in fig. 1. The correct level is at the bottom of the filler hole when the filler hole is centered between the two flywheel housing marks as shown.

Do not check the oil except where excessive slippage occurs. Oil should be at room temperature when checking level.

CAUTION: Never remove plug when oil is hot.

The transmission has the conventional manually operated low and reverse gears controlled by the gear shift lever.

The second speed position of the gear shift lever is used to lock out the automatic shifting feature of the transmission and prevents it from shifting to high gear. This permits using the engine as a brake through second gear when descending steep hills and permits starting the engine by towing the car.

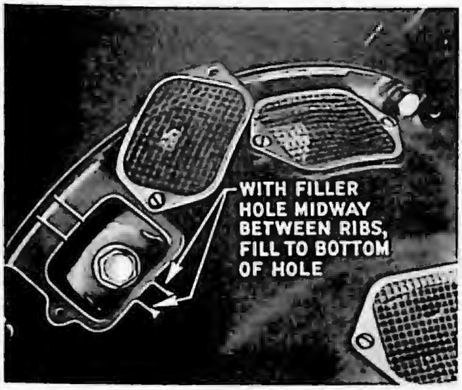


Fig. 1

The former high gear position of the gear shift lever puts the transmission in "driving" range in which position the start is in second gear and the shift from second to high gear is automatic as controlled by the speed, load and manipulation of the accelerator pedal.

In this position the transmission is in second gear all of the time, even when in high gear. In other words the transmission is in two gears at the same time when in high gear. This is possible because of an overrunning clutch in the transmission counter shaft front gear that permits the countershaft to run faster than the gear that drives it when in second gear.

The shift into high gear is prevented by a heavy spring in the vacuum cylinder. When the vacuum cylinder operates, a "pull" spring (coiled around the piston rod of the vacuum cylinder) operates the high gear lever which in turn moves the sliding collar on the mainshaft forward under spring tension. The purpose of this sliding collar is to lock the clutch shaft and the main shaft together so that they will turn together at the same speed (direct drive).

A balk ring however is provided that prevents the two shafts locking together until the torque of the engine is broken and the load is taken off of the gear teeth.

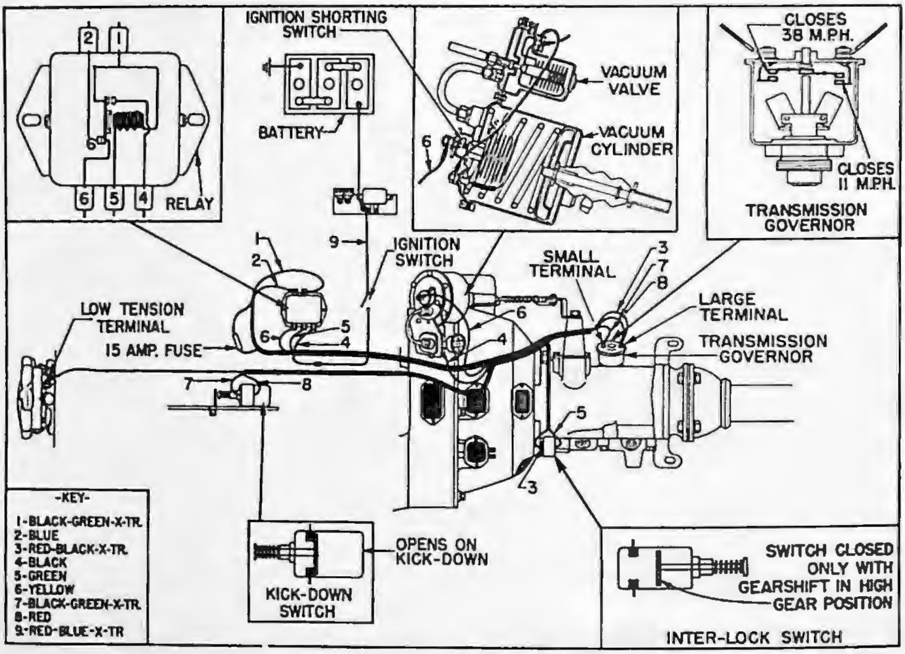
Figure 2 shows the various automatic controls and connections.

Figure 3 on page 104 is a wiring diagram of the controls.

The governor is the flyball type having two sets of points. The low stage points close at 11 miles per hour. They prevent going into high gear below 11 M.P.H. The high stage

EQUIPMENT USED
HEYER-HI FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:
STARTING 1942



points close at 38 M. P. H. and prevent kicking back from high gear to second gear at speeds above 38 M.P.H.

The kickdown switch is normally closed but opens when the throttle rod is extended beyond the wide open position. If the high stage points of the governor are open (below 38 M.P.H.) the circuit through the relay is broken and the spring in the vacuum cylinder causes the high gear sliding collar to disengage and the transmission is then in second gear. This permits shifting from high to second at speeds between 11 M.P.H. and 38 M.P.H. when more power is required.

The interlock switch located on the left side of the transmission locks out the automatic features when the gear shift lever is in any position other than driving range. In driving range the switch is closed completing the circuit from the relay to the governor.

The Vacuum valve when energized shuts off the outside air from, and opens the forward side of the vacuum cylinder to manifold vacuum causing the vacuum piston to work.

The holding coil mounted in the vacuum cylinder is in series with the vacuum valve, when energized it holds the piston at the top of its stroke.

ABOVE APPLIES TO MODELS:

STARTING 1942

EQUIPMENT USED

HEYER-H1 FORD LABORATORY TEST SET

Feb. 6, 1942

Printed in U.S.A

Mercury Liquamatic Drive (cont.)

The Relay mounted on the forward side of the dash is controlled by the governor, kickdown switch and the interlock switch, it is energized when the circuit is grounded through the governor. The relay is provided with two sets of points. The one set of points closes when the relay is energized (circuit grounded) and completes a circuit to the vacuum valve which shuts off the outside air from and exposes the forward side of the vacuum piston to manifold vacuum causing the vacuum cylinder to work. These points also energize the holding coil in the vacuum cylinder.

The other set of points opens when the relay circuit is energized (circuit grounded) breaking the circuit from the ignition condenser on the distributor to the ignition shorting switch in the vacuum cylinder.

The ignition shorting switch (mounted on the vacuum cylinder) is closed when the vacuum piston is at the top of its stroke and opens when the piston moves downward approximately 3/8 inch. This requires only a fraction of a second. When this switch and the righthand relay points are both closed the ignition system is shorted and the engine will stop.

In normal operation the only time both of these points would be closed would be with the car in high gear running at some speed between 11 M.P.H. and 38 M.P.H. and the kickdown switch open. As soon as the kickdown switch is opened (when the throttle rod is extended beyond wide open position) the right hand points would close shorting the ignition through the ignition shorting switch. At the same time the vacuum valve would be de-energized and the piston would start to travel down. When the piston traveled 3/8 inch the ignition shorting switch would open and the ignition would be restored.

This ignition shorting switch only shorts out the ignition when the conditions are as outlined above. Its purpose is to break the torque of the engine when more power is needed so as to permit shifting from high to second gear.

At speeds above 38 M.P.H. the high stage points of the governor are closed completeing the circuit through the relay and the opening of the kickdown switch will have no effect. This prevents kicking down to second gear at high speeds.

Diagnosis of Complaints

Obviously the first step in diagnosing complaints on the liquamatic drive is to test the car on the road to confirm the impression received from the owners description of the trouble.

Tests for each of the units are given starting on page 105

Troubles usually will fall into one of the following groups and the suggestions, test or series of tests recommended usually will uncover the cause and permit correction:

Sluggish shift to high gear.

Accelerator linkage sticky.

Engine idle too fast, set at 350 R.P.M.

Does not shift to high gear.

Fuse is burned out.

Accelerator linkage sticky or engine idled too fast (set at 350 R.P.M.)

Check high speed lever pull spring.

Check vacuum lines and connections.

Check relay. (see page 105)

Check vacuum valve. (see page 106)

Check governor. (see page 105)

Check continuity of circuits (see page 106) including check interlock and kickdown switches.

Remains in high gear when car speed drops below 11 M.P.H. or when car is stopped.

Test relay.

Circuit may be grounded at any point from center terminal on bottom of relay to low stage points of the governor. Test governor and circuit.

EQUIPMENT USED

HEYER HI FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:

STARTING 1942

Sluggish accelerator kickdown stays in high gear momentarily after depressing accelerator to floor:

Improper adjustment of rod from vacuum cylinder piston to high gear lever. Proper adjustment is to have a slight tension on rod adjust rod so it has no backlash in second speed position to one turn long on rod adjustment.

Faulty or loose connections at; condensor on distributor, center terminal at vacuum cylinder or at relay terminals.

Broken wires check continuity of circuits.

No accelerator kickdown stays in high gear when accelerator is depressed to floor (note kickdown is not intended to operate at speeds above 38 M.P.H.).

Kicker on throttle rod not adjusted properly should be set to open kickdown switch which opens the circuit to low stage points on the governor when throttle rod is extended beyond wide open position.

Improper adjustment of rod from vacuum cylinder piston to high gear. Proper adjustment is to have a slight tension on rod (adjust rod so it has no backlash in second speed position to one turn long on rod adjustment.

Test relay.

Check continuity of circuit from distributor condensor to ignition shorting switch.

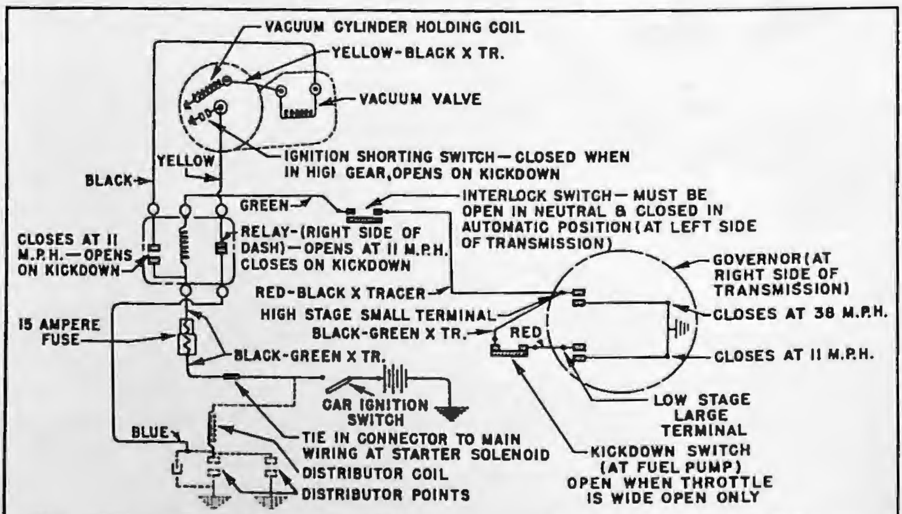
Test ignition shorting switch.

Too much tension on points of ignition shorting switch should require only 6 to 8 ounces to close.

Kicksdown at speeds above 38 M.P.H.

Test high stage points of governor (contact may be faulty).

Test relay.



LIQUAMATIC WIRING DIAGRAM

Fig. 3

ABOVE APPLIES TO MODELS	EQUIPMENT USED
STARTING 1942	HEYER HI FORD LABORATORY TEST SET

Feb. 6, 1942

Printed in U. S. A.

MERCURY LIQUAMATIC DRIVE (cont.)

TEST GOVERNOR

1 With rear axle on horses and gearshift lever in driving range start the engine.
2 Connect negative interrupter lead to negative low tension lead.
3 Plug meter in 15 volt socket.
4 Connect positive low tension lead to low stage points of the governor (low stage points have only one wire running to them).
5 Connect negative high tension lead to ground, points should be open at idle speed (no reading).
6 Slowly increase engine speed, points should close at approximately 11 M.P.H. As the points close, the circuit will be completed and a reading of battery voltage will be obtained.
7 Connect the positive low tension lead to the terminal for the high stage points (terminal with 2 wires).
8 Remove the plug connector from the kickdown switch.
9 Increase the engine speed. Points should close at approximately 38 M.P.H. As the points close the circuit will be completed and a reading of battery voltage will be obtained.
10 If points operate as outlined above governor is OK, otherwise replace the governor.

TEST RELAY

1 Turn ignition switch on. (don't start Engine)
2 With a screw driver ground center terminal on bottom of relay to body, if no spark or click is obtained check circuit from ignition switch to relay.
3 Connect negative low tension lead to left-hand terminal at bottom of relay (black wire).
4 Plug meter in 15 volt socket.
5 Ground positive low tension lead.
6 Points should be closed when center terminal is grounded, reading will be battery voltage.
7 Disconnect ground from center terminal points, should now open (no reading).
8 Connect negative interrupter lead to negative low tension lead.
9 Connect positive low tension lead to right-hand terminal on top of relay (blue wire). Connect negative high tension lead to right-hand terminal on bottom of relay (yellow wire). Points should be closed (reading battery voltage).
10 Again ground center terminal on bottom of relay. Points should now open (no reading on meter).
11 If relay meets the above requirements it is OK.

TEST KICKDOWN AND INTERLOCK SWITCHES

1 The **kickdown switch** should be closed except when the throttle rod is extended beyond full open position, at which time it should be open.
2 The **interlock switch** should be closed when gearshift lever is in driving range and should be open in all other positions.
3 Remove plug connection from switch to be tested.
4 Connect negative interrupter lead to negative low tension lead.
5 Connect positive low tension lead to one terminal of the switch.
6 Connect negative high tension lead to other terminal of the switch.
7 Plug meter in 15 volt socket.
8 There should be no reading when switch is open.
9 A reading of battery voltage should be obtained when switch is closed.
10 If switch meets this test it is OK.

EQUIPMENT USED
HEYER 111 FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:
STARTING 1942

Printed in U.S.A.

Feb. 6, 1942

TEST VACUUM VALVE

1 Connect negative interrupter lead to negative low tension lead.

2 Connect positive low tension lead to one terminal of the vacuum valve.

3 Connect negative high tension lead to other terminal of the vacuum valve.

4 Plug meter in 15 volt socket.

5 If reading of battery voltage is obtained, plug meter in 30 amp socket, this should cause valve to open.

6 Valve should close when meter plug is pulled out.

7 If vacuum valve meets the above test it is OK electrically.

TEST HOLDING COIL

1 Connect negative interrupter lead to negative low tension lead.

2 Connect positive low tension lead to one terminal of the holding coil.

3 Ground the negative high tension lead to vacuum cylinder cover.

4 Plug meter in 30 amp. socket. Core of holding coil should now be magnetized and a reading of approximately 4 amperes obtained.

5 Remove meter plug from 30 amp. socket, holding coil core should now not be magnetized and no reading on the meter.

6 If holding coil meets the above test it is OK.

TEST IGNITION SHORTING SWITCH

1 This switch normally is open and is only closed when vacuum piston is at the top 3/8 inch of its stroke. Disconnect the yellow wire from terminal of shorting switch.

2 Connect negative interrupter lead to negative low tension lead.

3 Connect positive low tension lead to shorting switch terminal.

4 Connect negative high tension lead to ground on vacuum cylinder cover.

5 Plug meter in 15 volt. socket.

6 Switch should be open (no reading) if reading is obtained switch is shorted.

7 Jack up rear wheels and put gear shift lever in driving range.

8 Reconnect yellow wire to terminal of shorting switch and again connect. Start the engine and allow to idle.

9 Ground center terminal on bottom of relay. This should cause vacuum piston to move to the top of its stroke closing shorting switch and a reading of battery voltage should be obtained.

10 If shorting switch meets above tests it is OK.

TEST CONTINUITY OF CIRCUITS

1 To check the continuity of any circuit use the test set as an ohmmeter.

2 Connect negative interrupter lead to negative low tension lead.

3 Plug meter in percent of dwell socket.

4 Connect negative high tension lead to positive low tension lead and adjust dwell rheostat to zero ohms on scale "R".

5 Connect positive low tension lead to one end of wire to be tested.

6 Connect negative high tension lead to other end of wire to be tested.

7 If no reading is obtained continuity is broken.

8 If a reading is obtained, this reading on scale "R" will be the resistance in ohms of the wire or portion of the circuit being tested.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
STARTING 1942	HEYER H1 FORD LABORATORY TEST

Feb 6, 1942

Printed in U.S.A.

TRANSMISSION OVERDRIVE

Operating principles.

The Overdrive unit is attached to the rear of the transmission. The main transmission shaft is replaced by the overdrive shaft extending into the transmission. Overdrive is accomplished by planetary gearing.

The planetary gearing consists of a central sun gear (4) three planetary pinions and an internal ring gear (2) surrounding the pinions.

When the car is operated with the dash button "in" (overdrive position) the change from STANDARD drive to OVERDRIVE is accomplished by the sun gear being held stationary by the pawl (9) in the adapter plate (8) shown at the right of Fig. 1.

The pawl (9) is slid into engagement of one of the six notches of the stationery gear plate (7) by means of the solenoid (10) after the car reaches a speed of approximately 25 MPH.

When the car speed falls below approximately 22 MPH at which time the pawl (9) is withdrawn from the adapter plate (8) by means of the solenoid (10), allowing the sun gear (4) to rotate, resulting in STANDARD drive as the entire gear set rotates as one unit.

Operating instructions

Return to STANDARD drive from OVERDRIVE at speeds above 25 MPH (for additional acceleration or power) is accomplished by pressing the accelerator pedal all the way down. The unit then remains in STANDARD drive until the foot pressure is removed from the accelerator pedal.

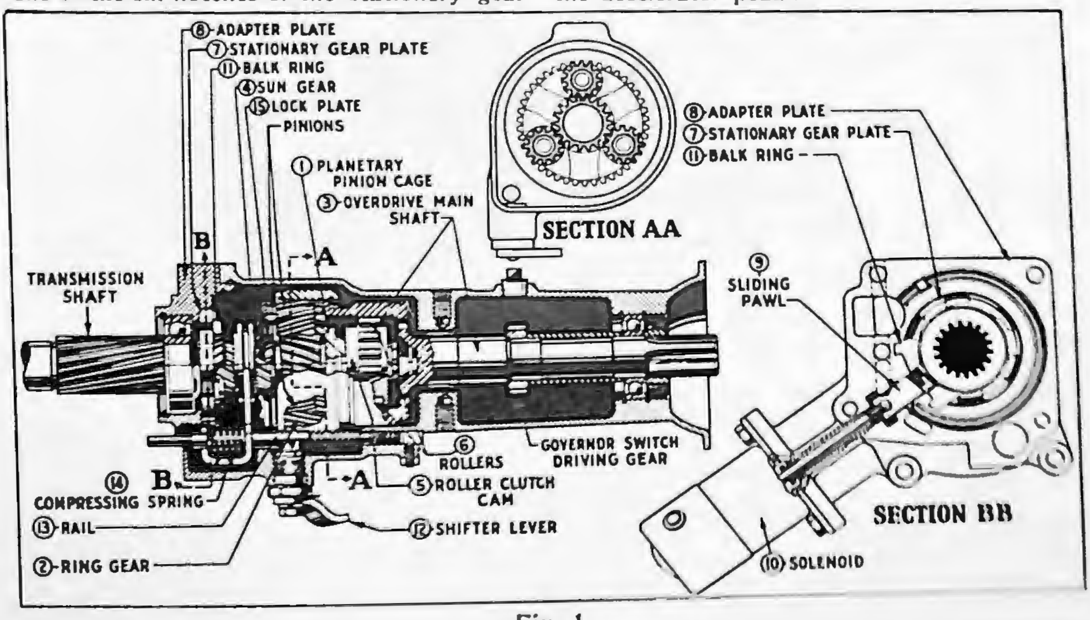


Fig. 1

ABOVE APPLIES TO MODELS

STARTING 1941

June 6, 1941

TEST VACUUM VALVE

1 Connect negative interrupter lead to negative low tension lead.

2 Connect positive low tension lead to one terminal of the vacuum valve.

3 Connect negative high tension lead to other terminal of the vacuum valve.

4 Plug meter in 15 volt socket.

5 If reading of battery voltage is obtained, plug meter in 30 amp socket, this should cause valve to open.

6 Valve should close when meter plug is pulled out.

7 If vacuum valve meets the above test it is OK electrically.

TEST HOLDING COIL

1 Connect negative interrupter lead to negative low tension lead.

2 Connect positive low tension lead to one terminal of the holding coil.

3 Ground the negative high tension lead to vacuum cylinder cover.

4 Plug meter in 30 amp. socket. Core of holding coil should now be magnetized and a reading of approximately 4 amperes obtained.

5 Remove meter plug from 30 amp. socket, holding coil core should now not be magnetized and no reading on the meter.

6 If holding coil meets the above test it is OK.

TEST IGNITION SHORTING SWITCH

1 This switch normally is open and is only closed when vacuum piston is at the top ⅜ inch of its stroke. Disconnect the yellow wire from terminal of shorting switch.

2 Connect negative interrupter lead to negative low tension lead.

3 Connect positive low tension lead to shorting switch terminal.

4 Connect negative high tension lead to ground on vacuum cylinder cover.

5 Plug meter in 15 volt. socket.

6 Switch should be open (no reading) if reading is obtained switch is shorted.

7 Jack up rear wheels and put gear shift lever in driving range.

8 Reconnect yellow wire to terminal of shorting switch and again connect. Start the engine and allow to idle.

9 Ground center terminal on bottom of relay. This should cause vacuum piston to move to the top of its stroke closing shorting switch and a reading of battery voltage should be obtained.

10 If shorting switch meets above tests it is OK.

TEST CONTINUITY OF CIRCUITS

1 To check the continuity of any circuit use the test set as an ohmmeter.

2 Connect negative interrupter lead to negative low tension lead.

3 Plug meter in percent of dwell socket.

4 Connect negative high tension lead to positive low tension lead and adjust dwell rheostat to zero ohms on scale "R".

5 Connect positive low tension lead to one end of wire to be tested.

6 Connect negative high tension lead to other end of wire to be tested.

7 If no reading is obtained continuity is broken.

8 If a reading is obtained, this reading on scale "R" will be the resistance in ohms of the wire or portion of the circuit being tested.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
STARTING 1942	HEYER III FORD LABORATORY TEST

TRANSMISSION OVERDRIVE

Operating principles.

The Overdrive unit is attached to the rear of the transmission. The main transmission shaft is replaced by the overdrive shaft extending into the transmission. Overdrive is accomplished by planetary gearing.

The planetary gearing consists of a central sun gear (4) three planetary pinions and an internal ring gear (2) surrounding the pinions.

When the car is operated with the dash button "in" (overdrive position) the change from STANDARD drive to OVERDRIVE is accomplished by the sun gear being held stationary by the pawl (9) in the adapter plate (8) shown at the right of Fig. 1.

The pawl (9) is slid into engagement of one of the six notches of the stationery gear plate (7) by means of the solenoid (10) after the car reaches a speed of approximately 25 MPH.

When the car speed falls below approximately 22 MPH at which time the pawl (9) is withdrawn from the adapter plate (8) by means of the solenoid (10), allowing the sun gear (4) to rotate, resulting in STANDARD drive as the entire gear set rotates as one unit.

Operating instructions

Return to STANDARD drive from OVERDRIVE at speeds above 25 MPH (for additional acceleration or power) is accomplished by pressing the accelerator pedal all the way down. The unit then remains in STANDARD drive until the foot pressure is removed from the accelerator pedal.

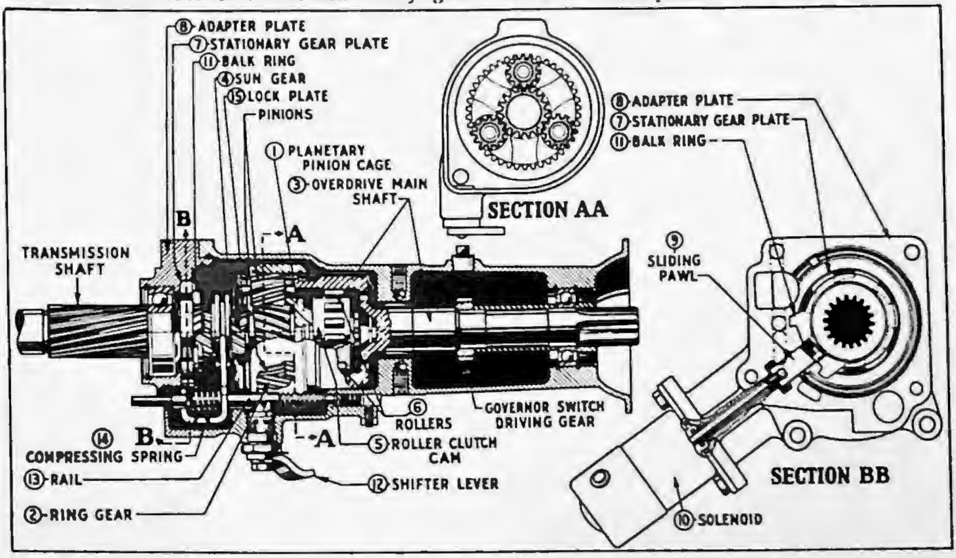


Fig. 1

ABOVE APPLIES TO MODELS:

STARTING 1941

Printed in U.S.A.

June 6, 1941

SERVICE BULLETIN

SUBJECT NO. 7650 PAGE NO. 12

Should the driver desire to operate the transmission as a conventional unit, pulling the dash control button "out" moves the sun gear (4) into engagement with the lock plate (15). The proper procedure is first to press the accelerator pedal all the way down, then pull out the dash button and release the accelerator pedal.

If the dash button is pulled out without depressing the accelerator, the result will be a harmless buzzing of the sun gear clutching teeth against the lock plate (15). If the driver then opens the throttle and closes it, the sun gear will enter the lock plate and the buzzing will cease.

The driver may restore the OVERDRIVE at any time by merely pushing in the dash button, without regard to accelerator pedal position.

Governor switch

The governor contains a switch normally open at low speeds, but which closes at speeds above approximately 25 miles per hour. When this switch is closed a circuit is completed for the relay terminal No. 5 through the upper terminal of the kick-down switch and through the lockout switch, these two latter switches being normally closed. The lock out switch opens the circuit when transmission is in reverse or when dash button is pulled out.

Likewise, when car speed falls below the cutout speed (approximately 22 miles per hour) the governor switch opens and the solenoid being no longer energized, the pawl is withdrawn from engagement by means of a spring contained in the solenoid.

Wiring diagrams

Wiring diagram, figure 2, covers wiring on 1941 cars manufactured previous to November 10th. Wiring diagram, figure 3, covers wiring on 1941 cars manufactured after November 10th.

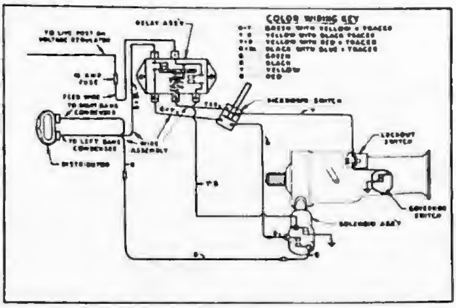


Fig. 2

Kick-down switch

The kick-down switch opens the relay and de-energizes the solenoid. Pressing the kick-down switch likewise closes the lower contacts of the switch and causes the relay to close a pair of contacts and connect terminal No. 2 and No. 6 of the relay. Also, when in overdrive, a pair of contacts connecting solenoid terminals No. 6 and No. 7 are closed. A circuit is completed through these contacts (relay kick-down switch and solenoid in series), whereby the right and left ignition breakers are grounded, for an instant, thus interrupting the ignition and releasing the torque which would otherwise prevent the release of the pawl (9). Upon

(Continued on page 13)

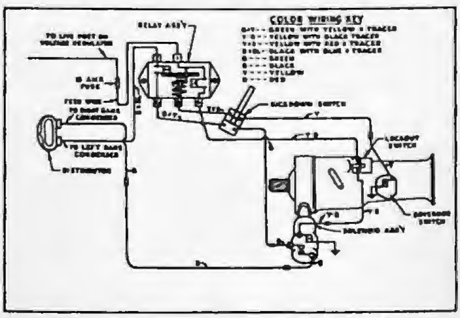


Fig. 3

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(Continued from page 12)

the interruption of the torque, the pawl releases and opens the pair of contacts within the solenoid (between terminals No. 6 and No. 7), thereby restoring the ignition circuit.

The unit will remain in standard drive until such time as the driver chooses to return to overdrive, at which time he closes the throttle in the usual way, the engine slows down and the overdrive is engaged.

Solenoid

The solenoid is connected to the sliding pawl by means of a ball end, flattened on two sides. It is necessary to twist the solenoid approximately 60 degrees right or left to disengage the solenoid stem from the pawl.

The sliding pawl engages the stationary plate by electrical impulse and releases from the stationary plate by a spring on the inside of the solenoid when the electrical circuit is broken. The solenoid consists of two magnetic coils. One coil is for actuating the stem and pawl and the other coil for holding the pawl into the stationary plate. The holding coil draws approximately 1.5 amperes.

Relay

The relay assembly serves to control the current which energizes the solenoid (10).

In the early production, the relay was installed on the dash, with terminals No. 4, No. 5 and No. 6 to the top of the relay, and it is advisable where such installations are encountered to dismount the relay and turn it so that terminals No. 1 and No. 2 are on top, after carefully inspecting for and blowing out any metallic foreign matter that may be lodged anywhere among the terminals.

Assembly instructions *See Fig. 4.*

1 Install bearing 16H—7065 on the transmission shaft.

2 Select proper thickness snap ring for holding bearing on shaft so that there is no end play but turns freely.

The snap ring is supplied in following sizes:

16H—7667 A	.087 thick
16H—7667 B	.090 thick
16H—7667 C	.093 thick
16H—7667 D	.096 thick
16H—7667 E	.102 thick

3 Install oil baffle 16H-7668 in adapter plate, 16H-7659

4 Install transmission shaft and bearing to adapter plate.

5 Select proper thickness snap ring for holding bearing in the adapter plate.

The snap ring is supplied in following thickness:

16H—7669 A	.087 thick
16H—7669 B	.090 thick
16H—7669 C	.093 thick
16H—7669 D	.096 thick

End play in the bearing is controlled by the above snap ring.

6 The stationary gear plate 16H-7662 and balk ring is serviced as an assembly and is next assembled into the rear of the adapter plate.

7 Install the sliding pawl 16H-7690 in position in the adapter plate.

8 Install cover plate 16H-7665 in position with tongue over the sliding pawl.

9 Install snap ring 16H-7666 in the groove in the adapter plate.

10 Install interlock plunger 16H-7691 in hole between sliding pawl and shifter shaft.

11 Install shifter shaft assy. 16H-7680 in position in the adapter plate.

12 Install sun gear 16H-7670 on the transmission shaft and enter the fork in the groove in the sun gear.

13 Install over-running clutch 16H-7675 on pinion cage assembly, 16H-7673, fastening together with retainer 16H-7674.

14 Install over-running clutch and pinion cage assemblies on the rear end of the transmission main shaft.

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15 Install retainer 16H-7676 at the rear end of the over-running clutch.

16 Use a rubber band to hold the rollers in place on the over-running clutch unit while assembling. The rubber band may be left in the case as it will do no harm.

17 Install main shaft assy. 16H-7652 over the pinion cage assy. and push it forward until the over-running clutch enters its outer race. Rotating the shaft assembly in a counter clockwise direction will facilitate assembly.

18 The overdrive housing 16H-7650 when supplied through service includes the front roller bearing 16H-7698. Install shifter shaft retractor spring in housing.

19 Attach overdrive housing to adapter plate using gasket 16H-7661.

20 Install governor gear 16H-6921 and spacer on the main shaft.

21 Install rear bearing 16H-7697 at rear of case.

22 Select proper thickness snap ring for holding the rear bearing in the case.

The snap ring is supplied in following thickness.

16H—7656 A	.062 thick
16H—7656 B	.065 thick
16H—7656 C	.068 thick
16H—7656 D	.071 thick

This snap ring controls the end play in the bearing.

(Continued on page 16)

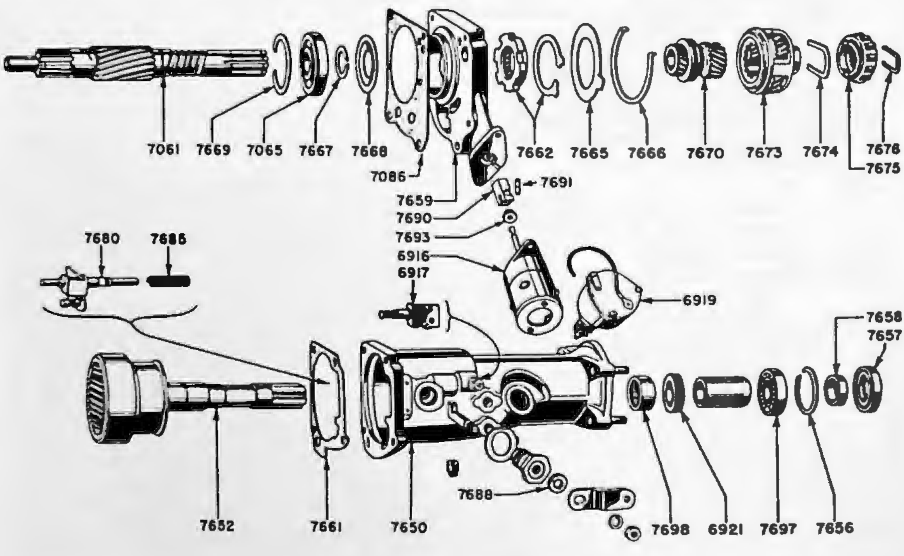

Fig. 4

ABOVE APPLIES TO MODELS:

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SERVICE INSTRUCTIONS—OVERDRIVE CONTROL

All ordinary servicing of this unit can be done by adjustment and corrections to the external controls

CONDITION	TEST PROCEDURE	RESULTS OF TEST	PROBABLE CAUSE	REMEDY
If overdrive does not engage when driven above 25 m.p.h.	(A) Accelerate car and listen for click of the relay at speed of approximately 25 m.p.h.	If relay clicks	Relay wiring or solenoid	Inspect No. 4 lead. Apply test (L) before replacing solenoid or relay
		No relay click	Fuse, relay switches, governor or connections	Inspect fuse. Apply test (B)
	(B) Ground governor terminal	If relay clicks No click [apply test (C)]	Governor	Replace
	(C) Ground screw terminal on lock out switch (this test applicable only to cars built prior to Nov. 10, 1940)	If relay clicks	Lockout switch	Replace
		No click [apply test (D)]		
	(D) Ground governor terminal and move dash control button backward and forward (this test applicable only to cars built after Nov. 9, 1940)	Solenoid clicks [apply test (E)]		
		No click	Defective lockout switch	Replace
	(E) Ground upper terminal on kick-down switch, nearest relay	If relay clicks	Kickdown switch	Replace
		No click [apply test (F)]		
	(F) Ground No. 5 terminal of relay with test lamp between No. 4 to ground	No click	Fuse, relay or hot connections	Replace relay if fuse and connections are good
		If click, but no light	Relay	Replace
		If click, and lamp lights, but no solenoid click	Solenoid or connections	After inspecting connections, replace solenoid
		Relay and solenoid both click	Solenoid stuck	Replace
Car stays in overdrive all the time, will not roll backwards.	(G) Ground relay No. 5 terminal, or disconnect lead from terminal	No click, or click when wire is removed from and touched to terminal	Ground between relay and governor	Remove ground or replace grounded parts
		No click when grounded, no click when wire is removed from and touched to terminal	Relay defective or grounded by chips	Blow out chips, or replace relay
		If relay clicks	Solenoid stuck	Replace
	(H) With engine idling, operate kickdown switch	Ignition cuts out completely	Solenoid stuck	Replace
			Overdrive unit locked	Replace if unable to release by rolling the car forward slightly
Overdrive engages and disengages, but will not kick down from accelerator pedal.	(I) With engine idling, ground relay terminal No. 2	Left bank cuts out	Open connection between No. 2 and condenser	
		Ignition not disturbed [apply test (J)]		
	(J) With engine idling, ground solenoid terminal No. 6, operate kickdown switch	Left bank cuts out	Solenoid	Replace after [applying test (J)]
		Ignition undisturbed	Kickdown switch	Replace
	(K) With engine idling, ground relay terminal No. 6	Left bank cuts out [apply test (L)]		
		Ignition undisturbed	Defective relay	Replace
	(L) With engine idling, ground solenoid terminal No. 7	Right bank cuts out, [apply tests (I) and (J)]		
		Ignition undisturbed	Open connection No. 2 to condenser	
Cuts out one bank when not in overdrive.		Ground between relay terminal No. 6 and kick-down switch or in relay or switch. Ground between No. 2 relay terminal and left condenser		
Cuts out one bank only when in overdrive.		Ground between solenoid terminal No. 6 and kick-down switch or in solenoid or switch		

Fig. 5

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23 Install oil seal 16H-7657 and spacer 16H-7658 at rear of case.

The governor gear will be free to turn on the main shaft unit. The universal joint is assembled to the shaft and tightened which will force the spacer at the rear of the gear against the gear, holding it sufficiently tight so it will turn with the shaft.

24 Install governor assy. 16H-6919.

25 Install grease retainer 16H-7693 in flange to which the solenoid is attached.

26 Install shift lever into bushing and install grease retainer 16H-7688 in the hexagon end of the bushing. Put on lever and install in overdrive case with lever in "up" position.

27 Install lock out switch 16H-6917 to the overdrive housing and fasten with set screw. (See Fig. 4)

28 Install solenoid to the flange on the adapter plate by inserting stem and turn approximately 60 degrees right or left and pull on the unit to make certain it is locked in the sliding pawl before assembling the flange bolts. Be sure to install the solenoid with the terminals for the wires "up".

Important: The solenoid should not be installed until the unit is assembled to the transmission, to avoid damage to the solenoid.

NOTE: On early production of 1941 cars, a short floor tunnel screw is provided in the position immediately ahead of the kick-down switch, and care should be observed in replacing floor tunnel screws, that the short screw be inserted in this position inasmuch as the regular length screw may strike the kickdown switch upper terminals, resulting in a ground at this point.

The kick down switch has been relocated on later cars therefore the special short screw will not be required at this location.

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Symptom 7999-X

Overdrive Will Not Kickdown

a. Preliminary Instructions.

Inspect, clean, and tighten all accessible terminals and wire connections.

Place the dash control in the overdrive position.

The 1941 model employs a short circuiting method to interrupt the ignition circuit, whereas the 1942 and 1946 models employ a method of grounding the circuit to interrupt the ignition. Check the interrupting and kickdown circuit, following *b*, *c*, and *d* below, whichever applies.

b. 1941 Models.

Run engine at a fast idle speed. Connect a jumper wire between No. 6 terminal on the relay and the right-hand condenser terminal (terminal to which the black wire is attached). Depress the kickdown switch independently of the accelerator pedal, and follow the procedure (1) or (2) below, whichever applies.

(1) *IF IGNITION IS INTERRUPTED.* If the ignition is interrupted, the solenoid points are faulty. Repair or replace solenoid.

(2) *IF THE IGNITION IS NOT INTERRUPTED.* If the ignition is not interrupted, connect the jumped wire between relay terminals Nos. 2 and 6. Ground relay terminal No. 5, depress the kickdown switch independently of the accelerator pedal. Follow *(a)* or *(b)* below, whichever applies:

(a) If the Ignition Is Interrupted. If the ignition is interrupted, it indicates the points in the relay are faulty. Replace the relay.

(b) If the Ignition Is Not Interrupted. If the ignition is not interrupted, the kickdown switch is at fault or an open circuit in the wires which are attached to the terminals mentioned above. Replace whichever is at fault.

c. 1942 Models.

Run engine at a fast idle speed. Ground Nos. 2 and 3 relay terminals, and follow the procedure given below for whichever of the conditions that applies.

(1) *IF THE IGNITION IS NOT INTERRUPTED.* If the ignition is not interrupted on the left bank when No. 2 relay terminal grounded and on the right bank when No. 3 relay terminal grounded, repair faulty wires, terminals or connections at wires extending from relay to condensers.

(2) *IF THE IGNITION IS INTERRUPTED.* If the ignition is interrupted, connect a jumper wire between Nos. 1 and 6 relay terminals. Follow *(a)*, *(b)*, or *(c)*, whichever applies:

(a) If the Ignition Is Not Interrupted. If the ignition is not interrupted on both banks, replace the relay.

(b) If the Ignition Is Interrupted. If the ignition is interrupted, stop the engine but leave the ignition switch ON. Disconnect the governor wire at the bullet connector, and ground the end of the wire which enters the loom.

(c) Indicator Light Goes Out. If the light in the speedometer face goes out when the governor wire is grounded and the relay does not click, replace the kickdown switch.

d. 1946 Models.

Run engine at a fast idle speed. Ground Nos. 2 and 3 relay terminals, and follow procedure (1) or (2), whichever applies.

(1) *IF THE IGNITION IS NOT INTERRUPTED.* If the ignition is not interrupted on the left bank with No. 2 relay terminal grounded and on the right bank with No. 3 relay terminal grounded, repair faulty wires, terminals, or connections at wires between relay and condensers.

(2) *IF THE IGNITION IS INTERRUPTED.* If the ignition is interrupted, run engine at idle speed. Connect a jumper wire between Nos. 1 and 6 relay terminals. Follow *(a)*, *(b)*, or *(c)* below, whichever applies.

(a) If the Ignition Is Not Interrupted. If the ignition is not interrupted, replace the relay.

(b) If the Ignition Is Interrupted. If the ignition is interrupted, stop the engine with Nos. 1 and 6 relay terminals still connected and depress the kickdown switch.

(c) Indicator Light Does Not Light. If the indicator light in the speedometer face does not light, replace the kickdown switch.

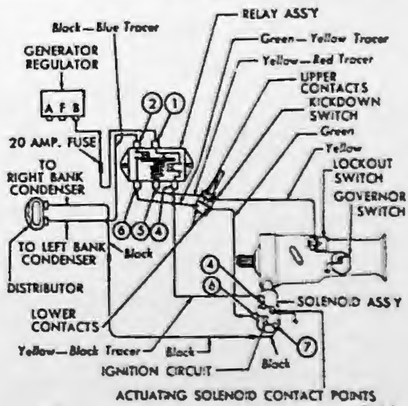

Figure 1—Early 1941 Wiring Diagram B-64

Symptom 7999-Y

Overdrive Will Not Disengage

a. Preliminary Instructions.

Remove the overdrive circuit fuse. Connect the ammeter negative lead to the generator regulator "B" terminal. Connect the positive ammeter lead to the No. 1 overdrive relay terminal, and follow the procedure given below for whichever of the conditions from (1) to (4) that apply.

(1) *IF AMMETER POINTER IS AT 0.* If the ammeter pointer is at 0, start the engine, and depress the kick-down switch. If the ignition cuts (engine stops), remove the solenoid. If the solenoid is stuck in the engaged position, repair or replace the solenoid. If the solenoid is not stuck, check the free movement of the sliding pawl. Engage the sliding pawl with a tool having a ball end similar to the pawl operating rod. Exert an outward pull equivalent to the solenoid spring, and turn the rear wheels simultaneously back and forth to release the tension on the sliding pawl. Failure of the sliding pawl to now disengage indicates that the balk ring, stationary gear plate, or the sliding pawl has been damaged. See Subject 7650 for repair procedure.

(2) *IF AMMETER READS APPROXIMATELY 2.5 AMPERES.* If the ammeter reads approximately 2.5 amperes, disconnect the wire connector at the governor. If the ammeter pointer now returns to 0, repair or replace the governor.

(3) *IF AMMETER READS APPROXIMATELY 2.5 AMPERES WITH GOVERNOR WIRE DISCONNECTED.* If the ammeter reading is approximately 2.5 amperes when the governor wire is disconnected, disconnect the wire from the No. 5 relay terminal. If the ammeter pointer returns to 0, repair or replace damaged or worn insulation on the governor to relay wiring. Check the kick-down switch upper terminals to make sure they are not grounded. When repairs of the insulation or switch terminals have been made, reconnect the wires to the governor and No. 5 relay terminal. The ammeter pointer will now remain at 0.

(4) *IF AMMETER READS APPROXIMATELY 2.5 AMPERES WITH NO. 5 RELAY TERMINAL WIRE DISCONNECTED.* If the ammeter reads approximately 2.5 amperes with the No. 5 relay terminal wire disconnected, disconnect the ammeter lead from the No. 1 relay terminal and the wire from the No. 4 relay terminal. Connect the No. 1 and No. 4 relay terminal with test light prods. If the test lamp lights, replace the relay. If the test light does not light, reconnect the ammeter lead to the No. 1 relay terminal. Move the meter selector switch to a lower meter scale that will permit a reading of 0.3 to 0.5 amperes. If the ammeter reading is 0.3 to 0.5 amperes, remove the relay assembly. Remove all corrosion and foreign matter lodged between the No. 5 relay terminal, the base, and the cover. Connect the ammeter lead to the No. 1 relay terminal. Contact the relay case to a good ground. If the ammeter pointer remains at 0, reinstall the relay assembly, and check the operation of the overdrive. If it does not remain at 0, replace the relay.

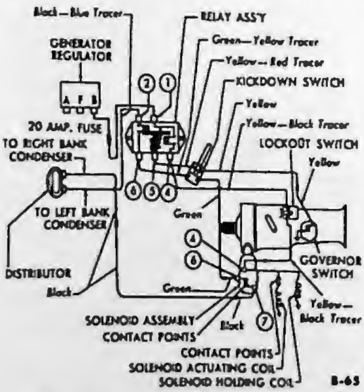

Figure 2—Late 1941 Wiring Diagram

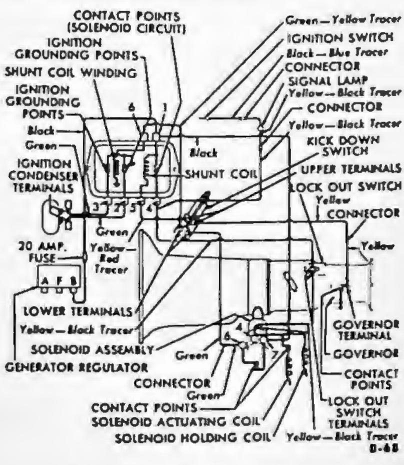

Figure 3—1942 Wiring Diagram

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Symptom 7999-Z

Overdrive Will Not Engage

a. Check 20-Ampere Fuse.

Check the condition of the 20-ampere fuse, located in series, with the wiring leading from the generator regulator "B" terminal to the No. 1 terminal of the overdrive relay, and follow the procedure given below for whichever of the conditions from (1) to (2) that apply:

(1) *IF FUSE IS BURNED OUT.* If the fuse is burned out, repair any damaged insulation in the wiring in the indicator light circuit and in the relay to solenoid circuit. Repair any damaged insulation wherever the overdrive or indicator light wiring touches the wire assembly retaining clips, frame, mud pans, or carpet screws which project through the toe board. Remove any corrosion or foreign matter lodged between the overdrive relay terminals and the base or cover. Bend the solenoid wire terminals to clear the solenoid case. Remove the overdrive circuit fuse. Connect the ammeter positive lead to the No. 1 overdrive relay terminal. Connect the ammeter negative lead to the generator regulator "B" terminal. Set the ammeter selector switch to the 90 or 100 ampere scale. Connect a voltmeter to the negative battery terminal and to ground. If the battery voltage is less than 6 volts, recharge or replace the battery. Put the dash control in the overdrive position. Momentarily ground the No. 5 relay terminal, and follow the procedure for whichever of the conditions from *(a)* to *(c)* that apply:

(a) If Ammeter Reading Is Approximately 6 Amperes Momentarily. If the ammeter reading is approximately 6 amperes momentarily, and then maintains a reading of 2.5 amperes, the overdrive control electrical units and the connecting wiring are normal.

(b) If Ammeter Maintains Reading of 18 to 20 Amperes. If the ammeter maintains a reading of 18 to 20 amperes, repair or replace the solenoid.

(c) If Ammeter Reading Is in Excess of 21 Amperes. If the ammeter reading is in excess of 21 amperes, disconnect the No. 6 solenoid terminal wire connector. If the ammeter reading is now 2.5 amperes, reconnect the No. 6 terminal connector. Disconnect the wire from the lower rear kick-down switch terminal. If the ammeter reading is now 2.5 amperes, replace the kick-down switch. If the ammeter reading is in excess of 21 amperes when the No. 6 solenoid terminal is disconnected, a short exists in the solenoid to relay wire assembly insulation or the Nos. 4, 6, and 7 solenoid terminal fiber insulation in the solenoid cover. Repair as required and retest. Install a 20-ampere fuse.

(2) *IF FUSE IS NOT BURNED OUT.* If the fuse is not burned out, remove the fuse. Connect the negative ammeter lead to the generator regulator "B" terminal. Connect the ammeter positive lead to the No. 1 overdrive relay terminal. Place the ammeter selector switch to the 30 or 50 ampere scale. Place the dash control button in the overdrive position. Jack up the rear axle. Start the engine. Shift the transmission into high gear. Slowly increase the engine speed until the speedometer reading is approximately 25 miles per hour, and follow whichever of the following conditions from *(a)* to *(g)* that apply:

(a) If Ammeter Momentarily Reads 6 Amperes, then Maintains a Reading of 2.5 Amperes. If the ameter momentarily reads 6 amperes, then maintains a reading of 2.5 amperes, the electrical overdrive control units are functioning normally.

(b) If Ammeter Reading Is Approximately 20 Amperes. If the ammeter reading is approximately 20 amperes, the solenoid plunger may be inoperative due to corrosion or transmission oil leaking into the solenoid. Repair or replace the solenoid assembly and the pawl operating rod oil seal in the adapter plate.

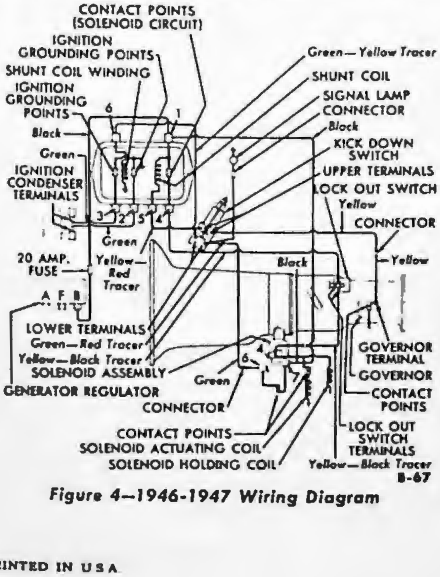


Figure 4—1946-1947 Wiring Diagram

(c) *If Ammeter Reading Does Not Increase to 6 Amperes Before Returning to 2.5 Amperes.* If the ammeter reading does not momentarily increase to 6 amperes before reading 2.5 amperes, repair or replace the solenoid.

(d) *If Ammeter Reading Remains at 0.* If the ammeter pointer remains at 0, stop the engine. Ground the governor terminal with a jumper wire. If the ammeter reading momentarily increases to approximately 6 amperes, then returns to 2.5 amperes, either the governor or governor drive gear is at fault. Remove the governor assembly, and check the governor drive gear for looseness. If necessary to tighten the drive gear, tighten the universal joint retaining cap screw, making sure that the universal joint retainer, part No. 7095, is in place before tightening. Connect the governor wire. Start the engine and raise the speed to 26 miles per hour. If the above momentary reading of 6 amperes which returns to and remains at 2.5 amperes is still not obtained, repair or replace the governor.

(e) *If Ammeter Reads 0 with Governor Terminal Grounded.* If the ammeter reads 0 when the governor terminal is grounded, momentarily ground the No. 5 relay terminal with a jumper wire. If the ammeter reading momentarily increases to 6 amperes, then maintains a reading of 2.5 amperes, check the governor wire connector for looseness and corrosion. Connect the kick-down switch upper terminals and again ground the governor terminal. If the ammeter momentarily reads 6 amperes and returns to 2.5 amperes, replace the kick-down switch.

(f) *If Ammeter Reads 0 with Relay Terminal No. 5 Grounded.* If the ammeter reads 0 when the relay terminal No. 5 is grounded, connect a jumper wire to the lock-out switch terminals. A reading of 6 amperes returning to 2.5 amperes indicates the overdrive dash control cable is out of adjustment or the lock-out switch is at fault. Remove the connecting jumper wire from the lock-out switch terminals. Disconnect the overdrive dash control cable at the overdrive control shaft lever. Move the lever to the rear of the car to the full extent of the lever travel, without forcing it. If the ammeter reads 6 amperes momentarily and then returns to 2.5 amperes, adjust the control cable to allow for full lever travel, allowing ⅛ inch clearance between control knob and the instrument panel. If the ammeter reads 0 when the control lever is placed at the full extent of its travel when disconnected from the control cable, replace the lock-out switch.

(g) *If Ammeter Reads 0 with No. 5 Relay Terminal Grounded.* If the ammeter reads 0 with the No. 5 relay terminal grounded, momentarily connect Nos. 1 and 4 relay terminals with a jumper wire. If the ammeter momentarily reads 6 amperes and then returns to 2.5 amperes, replace the relay.

b. Check Control Cable Adjustment.

Incorrect control cable adjustment will cause failure of the overdrive unit to engage. When properly adjusted, the control cable will move the lever on the overdrive unit to the extreme rear position. This will leave ⅛ inch clearance between the button and the dash. If the dash overdrive control cannot be moved when the engine is running and the transmission is in any forward speed, disconnect the cable at the overdrive unit. If the dash control is now free, move the overdrive control lever. If the lever cannot be moved, the sun gear is seized to the main shaft. See Subject No. 7650.

e. Check Solenoid Alignment.

Incorrect solenoid alignment will cause sluggish operation of the solenoid or cause it to fail to operate. With the overdrive electrical units functioning correctly, loosen both of the solenoid flange cap screws and retighten them evenly. Retest the operation of the overdrive for engagement. If the overdrive does not engage, remove the solenoid assembly, and test the alignment of the solenoid flange and pawl operating rod with a small combination square. If the pawl operating rod and solenoid flange are not at right angles to each other, replace the solenoid assembly.

d. Check Free Movement of Sliding Pawl.

Failure of the sliding pawl to move freely in the adapter plate will prevent engagement of the overdrive unit. Remove the solenoid assembly. Engage the sliding pawl with a tool having a ball end similar to the pawl operating rod. If the sliding pawl cannot be moved freely in the adapter plate, the sliding pawl or the adapter plate is damaged. See Subject 7650 for repair procedure.

e. Check Engagement of Sliding Pawl.

Failure of the sliding pawl to engage in the stationary gear plate when in overdrive will prevent engagement of the overdrive unit. Remove the solenoid assembly. With the car operated as outlined in subparagraph a (2) above, with the exception of accelerating and decelerating the engine at the overdrive cut-in speed of approximately 23 to 25 miles per hour, engage the sliding pawl with a tool having a ball end similar to the pawl operating rod, and exert a pressure on the pawl equivalent to the solenoid pawl operating rod spring pressure.

NOTE: *The sliding pawl is in engagement with the stationary gear plate when the measured distance from the ball end of the tool to the face of the adapter flange is 3⅞ inches.*

If the sliding pawl will not enter the stationary gear plate fully, or does not move freely in the stationary gear plate, stop the engine, and place the transmission in neutral. Turn the rear wheels simultaneously back and forth to release the tension on the sliding pawl. Failure of the sliding pawl to now engage indicates that the balk ring, stationary gear plate, or the sliding pawl has been damaged. See Subject 7650 for repair procedure.

June 7, 1947

Destroy Similar Page Dated July 7, 1947

8005—COOLING SYSTEM CAPACITY

Radiator Part Number	Quarts (In Vehicle) (Cold Liquid)
21A-8005	22
21C-8005-A	23
21T-8005-A	23
2GA-8005-A	15
2GAS-8005-A	
2GAS-8005-B	
2GC-8005-A	17
2GT-8005 A	17
2GT-8005-C	17
49B-8005-A	42

Radiator Part Number	Quarts (In Vehicle) (Cold Liquid)
49B-8005-B	42
51AS-8005	
59T-8005-A	23
5GA-8005	15
5GAS-8005	
8HA-8005	17
8BA-8005	21
8CM-8005-A2	21
8EL-8005	33

Radiator Part Number	Quarts (In Vehicle) (Cold Liquid)

8100—RADIATOR PRESSURE CAP

Part Number	Operating Pressure (Pounds) Minimum	Maximum
21TS-8100-A	3½	4½
41A-8100-A1 & 3	3¼	4¼
41A-8100-A2	3½	4½
41A-8100-B	3½	4½
26H-8100-B1	3½	4½

8510-8511—WATER PUMP SHAFT

Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)
52-8510	0.4990–0.4995	0.497
B-8511	0.6235–0.6245	0.6215
40-8511	0.6230–0.6235	0.621
46-8511	0.6235–0.6245	0.621
68-8511	0.4990–0.4995	0.497
78-8511-B	0.4990–0.4995	0.497
H-8511-BR	0.5901–0.5904	0.588
06H-8511	0.5901–0.5904	0.588
7RA-8511	0.4990–0.4995	0.497
7RA-8511-B	0.5903–0.5908	0.588

8520—WATER PUMP BUSHINGS

Part Number	Mfg. Inside Diameter of Bushing (Inches)	Inside Diameter of Bushing After Being Pressed in Housing (Inches)	Wear Limit Inside Diameter (Inches)	Mfg. Clearance Between Bushing and Shaft (Inches)	Wear Limit Clearance Between Bushing and Shaft (Inches)
B-8520	0.6265–0.6275			0.001–0.0025	0.004
18-8520	0.503 –0.504	0.5020–0.5025	0.5045	0.001–0.0025	0.004
40-8520		0.625 –0.626	0.628	0.001–0.0025	0.004
52-8520	0.5025–0.5035	0.5015–0.5025	0.5045	0.001–0.0025	0.004
78-8520	0.502 –0.503	0.5005–0.5015	0.5035	0.001–0.0025	0.004
1GA-8520	0.502 –0.503	0.5005–0.5015	0.5035	0.001–0.0025	0.004
H-8520-B	0.5895–0.5905	0.591 –0.592	0.594	0.001–0.0025	0.004
7RA-8520	0.502 –0.503	0.5005–0.5015	0.5035	0.001–0.0025	0.004
7RA-8520-B	0.5925–0.5935	0.5920–0.5925	0.5945	0.001–0.0025	0.004

Subject No. 8000 — COOLING SYSTEM — Page No. 2

8575—THERMOSTATS

Part Number	Make	Type	Location	Start to Open Degrees F.	Fully Open Degrees F.
40-8575-A	Dole	Bi-metal	Rad. Inlet Hose	140–145	175–180
52-8575-A	Dole	Bi-metal	Rad. Inlet Hose	140–145	175–180
52-8575-C	Dole	Bi-metal	Cyl. Head Outlet	148–152	170
78-8575-A	Dole	Bi-metal	Cyl. Head Outlet	148–152	175–180
78-8575-B	Dole	Bi-metal	Cyl. Head Outlet	148–152	175–180
09B-8575-B	Dole	Bi-metal	Cyl. Head Outlet	158–162	180–190
0NY-8575	Dole	Bi-metal	Rad. Inlet Hose	148–152	175–185
11A-8575-B	Fulton-Sylphon	Bellows	Cyl. Head Outlet	153	170
11AS-8575					
19B-8575-B	Evans-Sylphon	Bellows		150–155	175
1GA-8575-A	Bishop & Babcock Fulton-Sylphon	Bellows	Outlet Casting	153	175
06H-8575	Dole	Bi-metal	Rad. Inlet Hose	150–155	
8RT-8575-A1	Standard Thompson	Bellows	Outlet Connection	148–153	168–173
8RT-8575-A3	Fulton-Sylphon	Bellows	Outlet Connection	148–153	168–173
8BA-8575-B1	Standard Thompson	Bellows	Outlet Connection	157–162	177–182
8BA-7575-B2	Fulton-Sylphon	Bellows	Outlet Connection	157–162	177–182
7HA-8575-A1	Fulton-Sylphon	Bellows	Outlet Connection	157–162	177–182
7HA-8575-A2	Standard Thompson	Bellows	Outlet Connection	157–162	177–182
7HA-8575-B1	Fulton-Sylphon	Bellows	Outlet Connection	148–153	168–173
7HA-8575-B2	Standard Thompson	Bellows	Outlet Connection	148–153	168–173

8577-8620—FAN BELTS

Part Number	Approximate Length (Inches)
1GA-8577-B	16.81
21A-8577-A	36.75
2GT-8577-A	18.32
B-8620-A	42.42
BB-8620-A	54.77
40-8620-A	55.35
51-8620-A	52.58
52-8620-C	43.94
67-8620-A	53.48
78-8620-A	51.25
78-8620-B	50.50
78-8620-C	52.50
*99B-8620-A	55.46
70-8620	54.94

Part Number	Approximate Length (Inches)
9N-8620-B	43.24
1GA-8620-B	29.06
2GT-8620-A	31.97
2GA-8620-A	22.49
H-8620-R	52.56
96H-8620-A	51.78
7RA-8620-C	54.25
2GAS-8620-A	23.49
7HA-8620-A	41.38
8HA-8620	41.50

Part Number	Approximate Length (Inches)

*Used only in pairs

April 28, 1948

RADIATORS

STEEL FIN RADIATORS

Due to the need for conserving critical metals a steel fin radiator has been released for service replacements. Some of the steel fin radiators are longer than the copper fin radiator previously used. With the exception of the 1942 Ford and Mercury passenger cars, instructions for the installation of the long radiators on the 1942 models is as follows. These longer radiators can be installed on all models without alterations to the vehicle.

1942 Installation Procedures

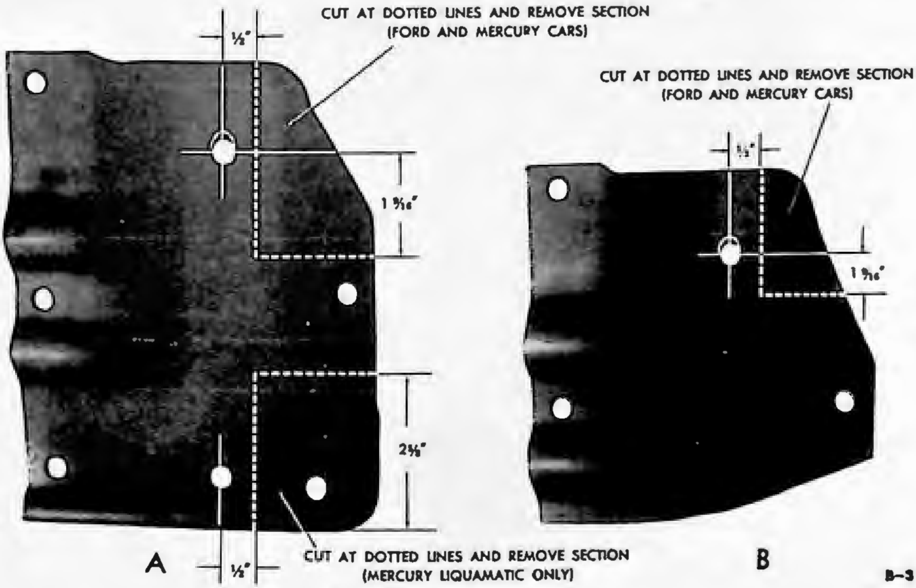
6-CYLINDER PASSENGER CARS

No alterations will be required to the radiator mounting brackets or shields on six cylinder passenger cars. However, the lower radiator hose will have to be replaced with two 2GA-8286-B lower hose and one 2GAS-8291 outlet pipes.

FORD V-8 PASSENGER CARS

Radiator Mounting Brackets

Some units will have mounting bracket "A" and some will have a mounting bracket "B" as shown in figure 1. Ascertain the type of bracket the vehicle is equipped with and notch out the bracket as shown in figure 1.



RADIATOR MOUNTING BRACKETS
Fig. 1

ABOVE APPLIES TO MODELS:
21-A and 29-A

Radiator Grille To Apron Support Shield

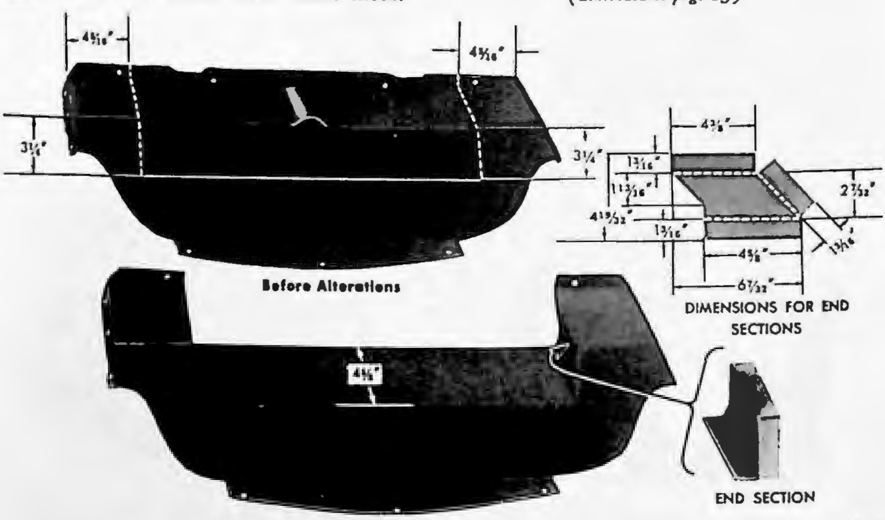
Remove the radiator grille to apron support shield (figure 2) from the vehicle. Cut the shield with tin snips or hack saw on both sides 4 5/16 inches from the outer edge of the top surface. Start the cut at the up-turned flange, then across the top flat surface, then down the inclined surface for a distance of 3 1/4 inches as shown by the dotted lines (figure 2). Flatten the center section (the section between the dotted lines). Bend the center section down along the plain line until parallel with the top surface of the shield.

It will be necessary to make a right hand and left hand end section as shown in figure 2. Use sheet metal of the same approximate thickness as the shield and cut it to the dimensions shown in the insert (figure 2). Bend it over at the dotted lines to form flanges. Assemble the end sections to the ends of the shield either with rivets, bolts, sheet metal screws or by welding. Flange the edge of the center section downward making the bend 4 5/8 inches from the solid line shown in figure 2 and cut off the surplus metal, leaving a 3/4 inch turned-down flange. Taper both ends of this flange for a distance of 3 inches. Bolt the shield in place in the vehicle.

Radiator Core To Front Cross Member Shield

Remove the radiator core to front cross member shield (figure 3) from the vehicle. Cut back the front edge of the shield 3/4 inch at the dotted line shown in figure 3. This cut back is to start at the reinforcement underneath the shield and gradually work back to a depth of 3/4 inch. Cut 1 1/2 inches off of the bottom rear edge of the shield at the dotted line as shown in figure 3. Form a 1/4 inch flange on this bottom edge to match the balance of the flange on the shield.

(Continued to page 13)



B-5

RADIATOR GRILLE TO APRON SUPPORT SHIELD FOR FORD CARS

Fig. 2

ABOVE APPLIES TO MODELS:

21-A and 29-A

(Continuing from page 12)

Make two mounting brackets using 16 gage metal, following the dimensions as given in figure 3.

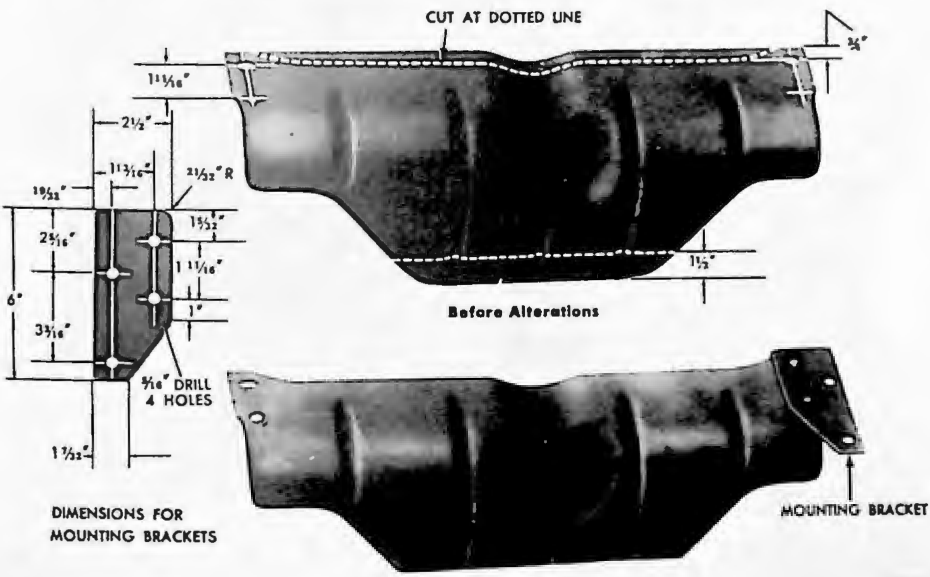
Install these mounting brackets to the bottom flange of each frame side member using the forward bolt of the torsion bar bracket for one hole. Drill a 13/32 inch hole through the bottom flange of the frame side member to line up with the other hole in the bracket. Bolt each mounting bracket to the frame side member and attach the shield to the brackets using four 1/4 inch x 11/16 inch 20 thread bolts with nuts and lock washers.

Replace the lower hose with two 21AS-8286 hose when reinstalling the radiator.

1942 MERCURY PASSENGER CARS

Radiator Mounting Brackets

Some units will have a mounting bracket "A" and some will have a mounting bracket "B" as shown in figure 1. Ascertain the type of bracket the vehicle is equipped with and notch out the bracket as shown in figure 1. The bracket on Mercury cars equipped with liquamatic drive will have to be notched out as shown in "A" figure 1.



Radiator Core to Front Cross Member Shield for Ford Cars

Fig. 3

ABOVE APPLIES TO MODELS:

21-A and 29-A

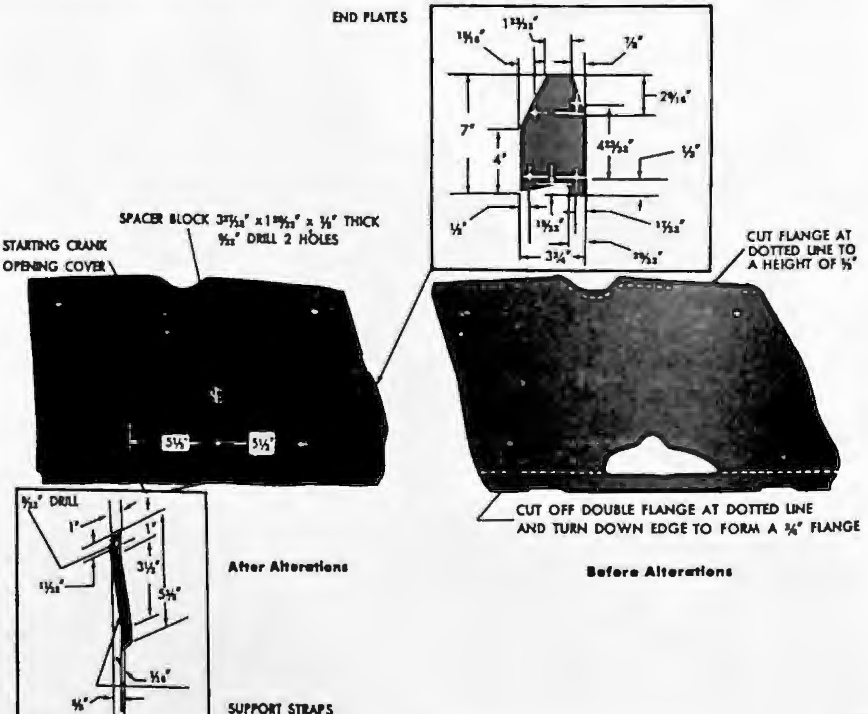
Printed in U.S.A.

May 1, 1944

Radiator Grille To Apron Support Shield

Remove the radiator grille to apron support shield (figure 4) from the vehicle. Cut off the double flange at the rear straight edge of the shield at the dotted line in figure 4. Form a ¾ inch flange at this edge so that when the shield is assembled in the inverted position this flange will be down as shown in the after alteration view (figure 4). Make a starting crank opening cover from 16 gage sheet metal. Assemble the cover to the underside of the shield as shown in "after alterations" figure 4 and secure it to the shield with either rivets, bolts, sheet metal screws or by welding. Make two support straps from 16 gage sheet metal

(Continued to page 15)



B-7

RADIATOR GRILLE TO APRON SUPPORT SHIELD FOR MERCURY CARS

Fig. 4

ABOVE APPLIES TO MODELS:

21-A and 29-A

(Continued from page 14)

according to the dimensions shown in figure 4. Weld the straps to the rear edge of the flange, spacing the straps 5½ inches on either side of the center line of the shield so that the holes in the straps will line up with the mounting holes in the fender apron support bar.

Make two end plates out of 16 gage sheet metal according to dimensions shown in figure 4. Assemble the end plates to the rear sides of the shield (figure 4) with either rivets, bolts, sheet metal screws or by welding.

Make a spacer block from a piece of hard wood according to dimensions shown in "after alterations" figure 4 and assemble it to the top of the shield. The right hand pair of holes in the shield are to be used for mounting the spacer. Secure spacer to the shield with two ¼ inch x 1⁵⁄₁₆ inch 20 thread bolts with nuts, flat washers and lock washers. Cut down the flange at the front edge of the shield to a height of ⅜ inch as shown by the dotted line (figure 4).

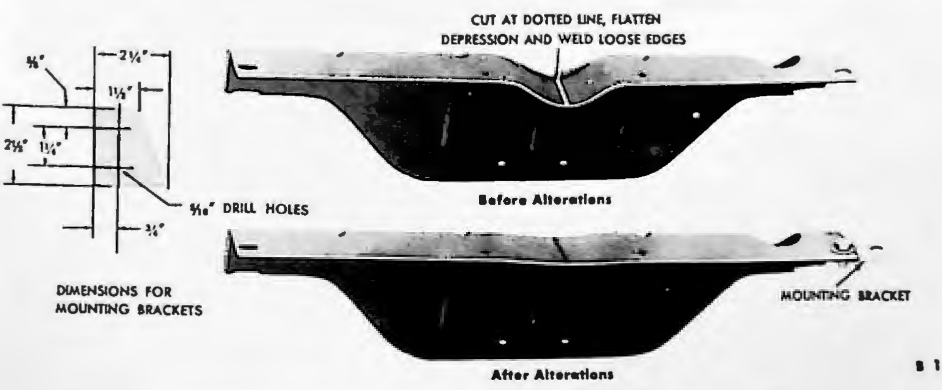
Bolt the shield into the chassis in the inverted position.

Radiator Core To Front Cross Member Shield

Remove the radiator core to front cross member shield (figure 5) from the vehicle. Flatten the starting crank clearance depression on the top surface by cutting the metal at the dotted line in the center of the depression, as shown in figure 5. Flatten out the depression and weld the edges together.

Make two mounting brackets from metal ¹⁄₁₆ inch thick according to the dimensions shown in figure 5. Assemble the brackets to the frame side members using the front torsion bar mounting bolt for securing the brackets to the frame. Assemble the shield in the chassis and secure it to the mounting brackets on each side with a ¼ inch x ¹¹⁄₁₆ inch 20 thread bolts with flat washers and lock washers.

Replace the lower hose with two 21AS-8286 hose when reinstalling the radiator.



RADIATOR CORE TO FRONT CROSS MEMBER SHIELD FOR MERCURY CARS

Fig. 5

ABOVE APPLIES TO MODELS:
21-A and 29-A

Instructions for Installing a Copper Fin Radiator on a 1942 Ford or Mercury Car which is Equipped with a Steel Fin Radiator

6 Cylinder Passenger Car

A copper fin radiator can be installed on the 6 cylinder passenger car which has been previously equipped with a steel fin radiator. No alteration of parts will be required, however, the two lower radiator hose and the outlet pipe must be replaced using standard parts.

Ford and Mercury Passenger Car

A copper fin radiator can be installed on a Ford or Mercury passenger car which has been previously equipped with a steel fin radiator. No alteration of parts will be required, however the radiator grille to apron support shield, radiator core to front cross member shield and the two lower hose connections must be replaced using standard parts.

ABOVE APPLIES TO MODELS:

21-A and 29-A

May 1, 1944

Printed in U.S.A.

FORD AND MERCURY RADIATOR MOUNTING

1942 Ford and Mercury cars being operated over rough roads may have a tendency to damage the radiator and cause leaks due to vibration. To reduce the possibility of this condition occuring, a change has been made in the method of mounting the radiator in the chassis. The new design radiator mounting suspends the radiator to each of the front fender apron support braces, instead of being spring mounted to the frame of the car.

Parts Required

New parts released for this operation.

Ford	Mercury	Part No.	Name
1		21-A-16140	Radiator to fender apron support panel assy. R.H.
1		21-A-16141	Radiator to fender apron support panel assy. L.H.
	1	29-A-16140	Radiator to fender apron support panel assy. R.H.
	1	29-A-16141	Radiator to fender apron support panel assy. L.H.
1	1	21-A-16156	Fender apron support tie bar
2	2	356374-S2	Radiator mounting bolt retainer washer

New standard parts required*.

Ford	Mercury	Part No.	Name
2	2	20359-S2	Bolt
2	2	33800-S2	Nut
2	2	34807-S2	Lock washer
2	2	34707-S2	Flat washer
2	2	20427-S2	Bolt
2	2	33798-S2	Nut
2	2	34806-S2	Lock washer
2	2	34706-S2	Flat washer
	2	20324-S2	Bolt
	2	33795-S2	Nut
	2	34805-S2	Lock washer

*The balance of the standard items required as shown in figures 1 and 2 can be salvaged from the standard items removed when disassembling.

ABOVE APPLIES TO MODELS:

21-A and 29-A

Printed in U.S.A.

May 1, 1944

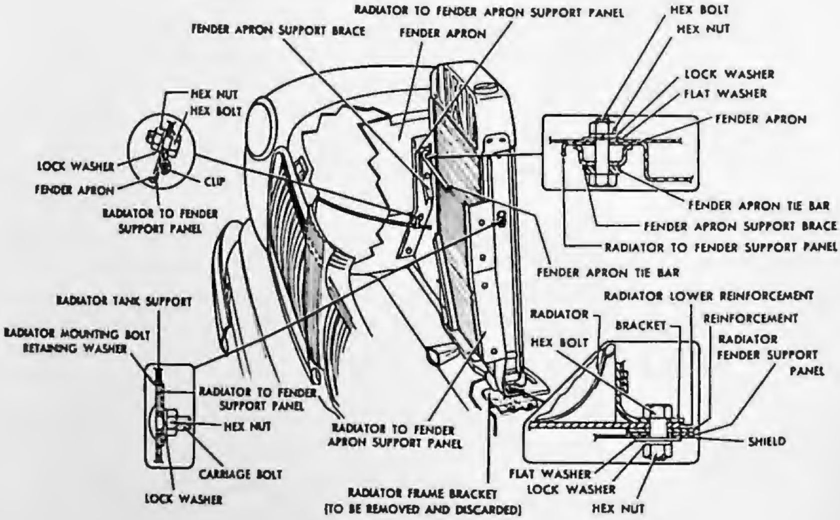
Preparation For Installation

Ford Cars

Remove the radiator from the vehicle. Remove the braces at each fender apron. Remove the fender apron tie bar (figure 1.) Remove the right and left air deflector bottom panel. Remove the two bolts which secure each of the radiator frame brackets and discard the brackets.

Mercury Cars

Remove the radiator from the vehicle. Remove the braces at each fender apron. Remove the fender apron tie bar (figure 2). Remove the right and left air deflector bottom panel. Cut the flange off these panels as shown in the insert figure 2. Remove the right and left air deflector upper panels. Cut a clearance notch in these panels ½ inch wide, ⅝ inch deep, and three inches down from the top edge so as to clear the fender apron tie bar when it is reassembled.



STEEL FIN RADIATOR MOUNTING FOR FORD CARS

Fig. 1

ABOVE APPLIES TO MODELS:
21-A and 29-A

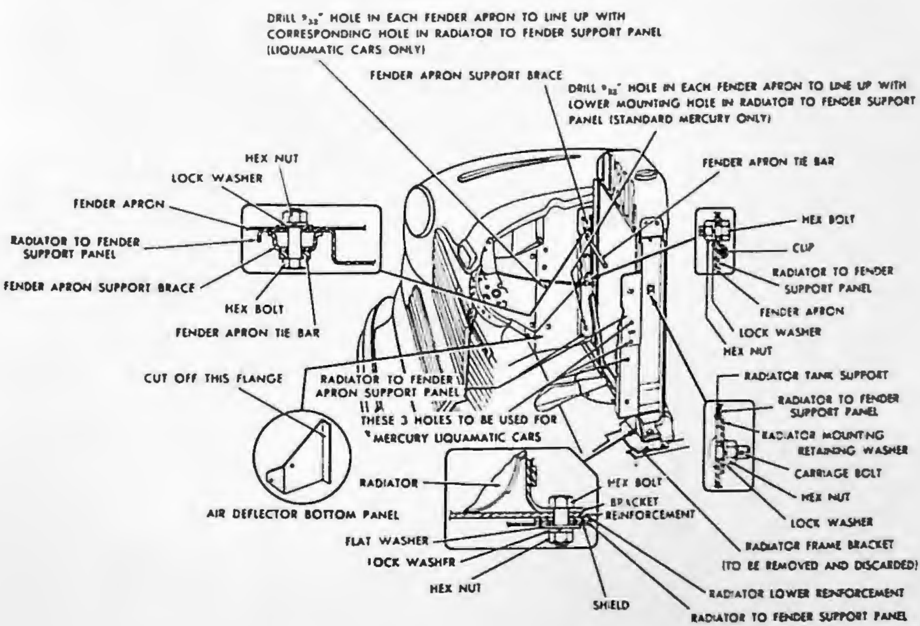
May 1, 1944

Printed in U.S.A.

Installation

Ford Cars

Attach the radiator support panels to the fender aprons, placing the support panel between the apron and the fender apron support brace (figure 1) Do not tighten the attaching screws at this time. Set the radiator between the support panels and secure it to them at the top and bottom with standard parts as shown in figure 1. Before tightening the radiator to the support panels, line the radiator up in order to secure proper clearance between the fan blades and the radiator core. Attach the front fender apron support tie bar and tighten all bolts. Install the right and left air deflector and insert the two bolts which secure the radiator grille to the radiator apron support shield and the radiator support panels.



STEEL FIN RADIATOR MOUNTING FOR MERCURY CARS
Fig. 2

B-6

ABOVE APPLIES TO MODELS:

21-A and 29-A

May 1, 1944

Mercury Cars

Attach the radiator support panels to the fender aprons, placing the support panel between the fender apron and the fender apron support brace (figure 1). Do not tighten the attaching screws at this time.

Set the radiator between the support panels and secure it to them at top and bottom with standard parts as shown in figure 1. Before tightening the radiator to the support panel, line the radiator up in order to secure proper clearance between the fan blades and the radiator or core.

Using the lower hole in the support panel as a guide, drill an extra 9/32 inch diameter hole in each fender apron to line up with the lower mounting hole in the support panel. Install the third mounting bolt in this hole.

Attach the front fender apron tie bar and tighten all bolts.

Install the upper and lower air deflector panels after the alterations have been made to the deflector panels as outlined under preparation for installation on Mercury cars, page 22.

Mercury Liquamatic Cars

The installation procedure for Mercury Liquamatic cars is the same as for the standard Mercury except two extra 9/32 inch diameter holes must be drilled in each fender apron. With the support panel in place on the fender apron, use the two lower mounting holes in the support panel as guides for drilling. Install the extra mounting bolts in each of these drilled holes.

ABOVE APPLIES TO MODELS:

21-A and 29-A

May 1, 1944

Printed in U.S.A.

WATER PUMP

PRESSURE GUN GREASE TYPE

Starting in 1932 a pressure gun grease type of water pump located at front of the cylinder head was adopted on all V-8 engines. These pumps were continued until the 1937 models.

Many special water pump lubricants are on the market and being offered to Ford dealers for use in these water pumps. Special lubricants are not required or desired. The use of ordinary pressure gun lubricant is recommended for these water pumps.

Fig. 4 shows the pump completely disassembled with all of the parts correctly positioned for assembly.

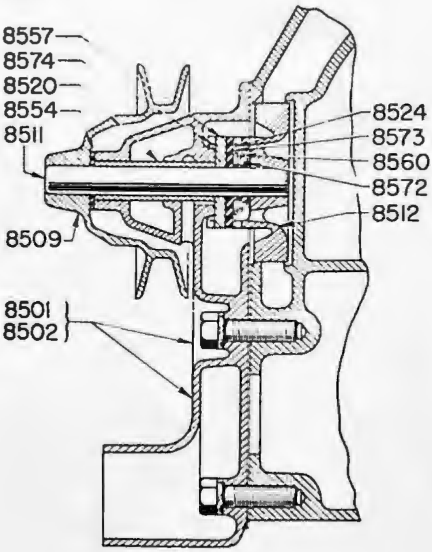


Fig. 1

A special kit of repair parts is available under numbers 18-18515 and 68-18515 which will prove convenient in repairing these water pumps.

When assembling the "pressure gun grease" type water pumps be sure that the 8560 spring is assembled with the large end of the spring next to the impeller. If this spring is installed incorrectly leakage of the water pump will result.

OIL RESERVOIR TYPE

Several types of oil reservoir water pumps were used in part production during the time that V-8 water pumps were assembled in the cylinder heads. Repair parts for these pumps are not available and when repairs on these pumps are required the entire assembly should be changed to the type shown in Fig. 2.

STARTING IN 1937

Starting with 1937 models the water pump was positioned in the cylinder block instead of in the head. Fig. 1 illustrates these pumps.

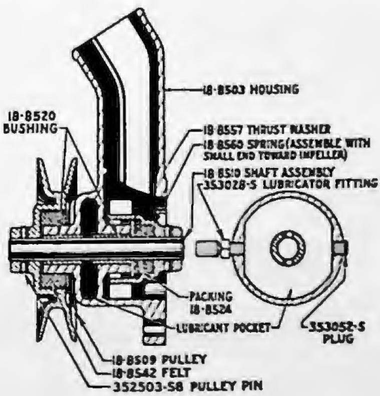


Fig. 2

EQUIPMENT USED
KRW -8503-A REFACER
KRW -8520-D DRIVER

ABOVE APPLIES TO MODELS:
ALL V-8 EXCEPT 60 H. P.

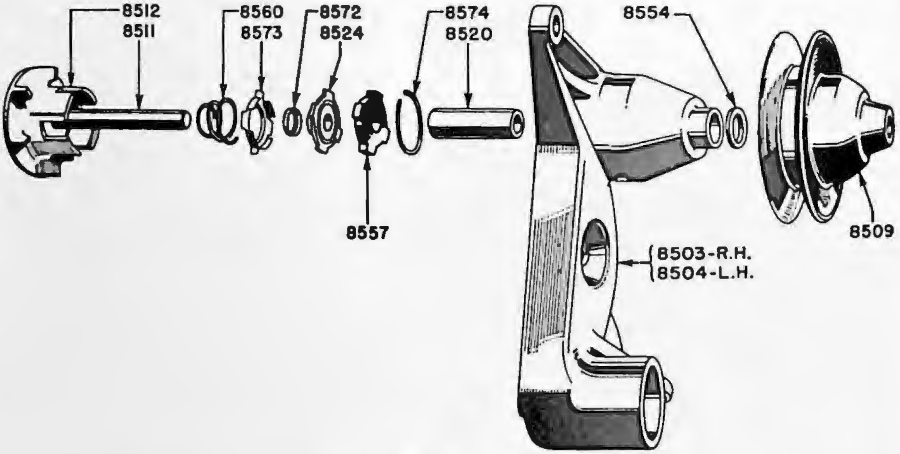


Fig. 3

These pumps are lubricated by the oil from the engine and require no additional lubrication or attention.

Fig. 3 is an exploded view of these pumps with the parts arranged in the order of assembly. It will be noted that the shaft is pressed out of the pulley to disassemble and not out of the impeller.

The 8520 bushing is porous so as to permit oil from the engine to lubricate the water pump shaft.

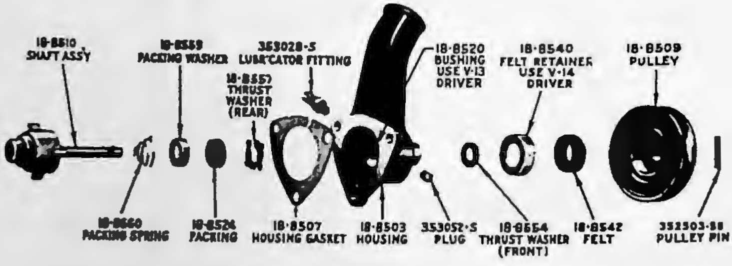


Fig. 4

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL V-8 EXCEPT 60 H. P.	KRW—8503-A REFACER KRW—8520-D DRIVER

WATER PUMP (6 Cylinder Engine)

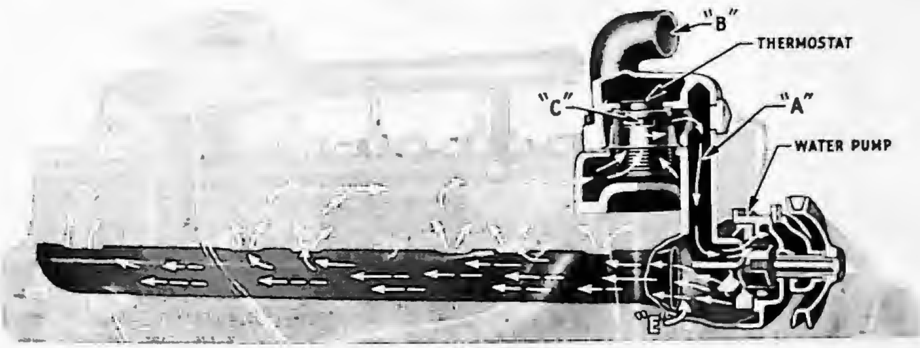


Fig. 1

In the six cylinder engine a water manifold made of stainless steel is used as shown in figure 1. This manifold is provided with an outlet at each exhaust valve seat.

Water from the water pump is circulated through this manifold to the exhaust valve seats first so as to more uniformly equalize the temperatures in the engine.

When the thermostat in the water outlet is closed, circulation of the water in the cylinder block is maintained. With the thermostat closed, water from the cylinder head passes up around the bellows of the thermostat and out through the holes "C" (see figure 1) and down through the passage "A" to the water pump.

Water from the pump enters the water manifold at "E" where it is distributed to the under side of the exhaust valve seats as shown by the arrows in figure 1.

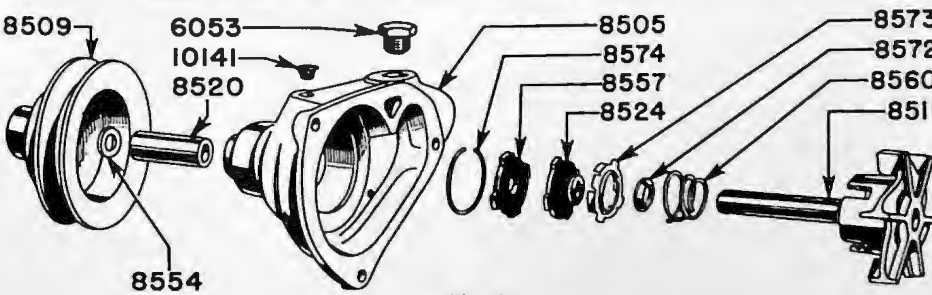


Fig. 2

ABOVE APPLIES TO MODELS:

6 CYL. STARTING 1941

Printed in U.S.A.

May 20, 1941

Figure 2 shows the various parts of the six cylinder engine water pump arranged in the order of assembly.

A porous bushing (8520) through which the shaft is lubricated is provided in these water pumps. Figure 1 shows the oil reservoir around the bushing and the oiler.

Remember, the cleanliness of your service department reflects the type of service you render.

ABOVE APPLIES TO MODELS:

6 CYL. STARTING 1941

May 20, 1941

Printed in U.S.A.

THERMOSTATS

All gasoline engines have a known operating temperature range that will give maximum efficiency and economy. To reach this temperature range as soon as possible and to maintain it while running, The Ford Motor Co. has, since 1933, incorporated thermostats in the engine cooling systems for localities where cold temperatures are encountered.

The function of these thermostats is to restrict the flow of water to the radiator until the efficient operating temperature range is reached and then to slowly open allowing just enough flow to constantly maintain this temperature. This assures a short "warming-up" period for the engine during winter operation and the ideal operating temperatures for efficiency throughout the year regardless of weather or atmospheric temperatures.

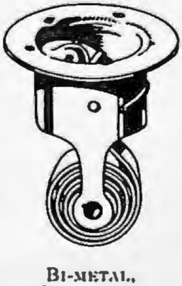
The Thermostats are designed to start to open at 145° F. and be fully open at 180° F.

Three types of thermostats have been used, one of which uses a **bimetal coil** to operate the valve.

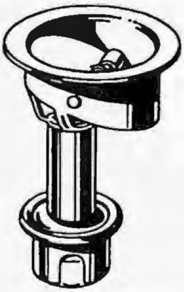
This type of thermostat was made for mounting in the hose prior to 1937 for Ford, and has been used on Lincoln-Zephyr since 1936 and all Lincolns starting 1941, See Fig. 1.

With the introduction of the 1937 models

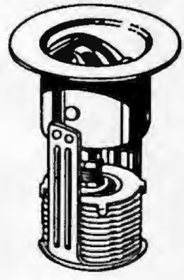
BI-METAL
HOSE MOUNTED
Fig. 1



BI-METAL,
HEAD OUTLET MOUNTED
Fig. 2



CHEMICALS
Fig. 3



BELLOWS
Fig. 4

it was changed for mounting in the cylinder head outlet for Ford units, as shown in Fig. 2.

During 1937 a new type of thermostat was introduced and adopted for partial production on Ford cars. These thermostats have for their operating element a **chemical compound** sealed in a chamber that forces a piston and connecting rod upward. The other end of the connecting rod is connected to a butterfly valve which controls the flow of the water in the cooling system. See Fig. 3.

During 1940 a third type was released for partial production on Ford and Mercury. This thermostat is shown in Fig. 4. The valve in this unit is operated by the expansion of a **fluid** in the **bellows** chamber.

Starting with 1941 models, a change was made in the bi-metal type thermostat that causes it to be locked open once it has been exposed to excessive temperatures.

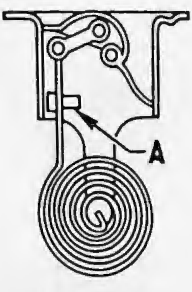
When the thermostat has been subjected to high temperatures the bimetal distorts and takes a set. This ordinarily results in a change of the opening temperature with the result that it will not open under normal operation and overheating results.

To remove this possibility a change was made in these thermostats to protect the

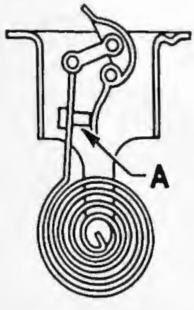
ABOVE APPLIES TO MODELS:

ALL

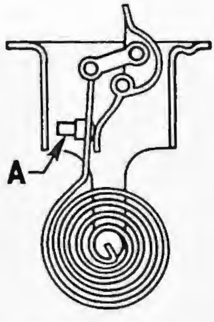
April 1, 1941



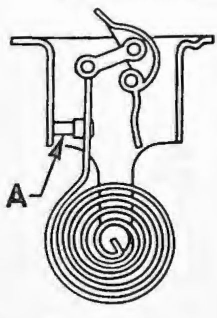
NORMAL CLOSED
Fig. 5



NORMAL OPEN
Fig. 6



STOP PIN MOVING
Fig. 7



STOP PIN HOLDS OPEN
Fig. 8

engine. This change consists of a stop pin (see "A") in the bimetal as shown in Fig. 5.

When in normal operation the thermostat is open this stop pin strikes the butterfly as shown in Fig. 6.

If the water in the cooling system is allowed to become too low the thermostat is subjected to temperatures greater than 324 degrees and the solder holding the stop pin melts allowing it to be pushed to the position shown in Fig. 7.

When the engine has cooled down this stop pin maintains its new position and prevents the thermostat from closing. This prevents the engine from overheating due to a damaged thermostat.

Thermostats should be discarded if the stop pin has moved to the position shown in Fig. 8. The stop pin will only assume this position when the water in the cooling system is allowed to become lower than the thermostat.

SERVICE INSTRUCTIONS

A In **early models the clamp** around thermostat used to hold it in poistion in the hose could be **too tight,** causing valve to stick (clamp only used on models **prior to 1935**).

B Hose line thermostats **installed upside down.**

C **Head outlet thermostats not held securely** in place. The shoulder in the inside of the hose provides a means of holding the thermostat in place. If the **hose** is **not forced down** tightly on the outlet there will be sufficient room to permit the thermostat to rock, allowing **water** to **bypass.** In addition, this rocking action strikes the coil supports against the sides of the head outlet casting which may in time **affect** the **characteristics** of the thermostat.

D **Dirt** and **pieces of rubber** hose becoming imbedded **on edge of butterfly.**

E **Failure to expel** all **air** from cooling system when filling radiator.

F With low-boiling point anti-freeze solution, such as **alcohol,** it is important to watch the liquid level in the radiator and to **replace** the **evaporated solution.**

ABOVE APPLIES TO MODELS:
ALL

April 1, 1941

Printed in U.S.A.

Symptom 8999-A

Engine Overheats

1. PRELIMINARY INSTRUCTIONS.

a. Original Margin of Safety.

The various factors that control the cooling of the engine are designed to provide a liberal margin of safety. In most cases, correction or adjustment of these controls will reestablish adequate cooling.

b. Shrouds and Baffles.

On trucks, the fan shrouds assure the air being drawn through the radiator and if the shroud has been removed, it should be installed before any tests are made. Likewise, any air baffles that were originally provided should be in place to prevent recirculation of the warm air from the engine compartment back through the radiator.

c. Special Equipment.

Heavy duty or desert operations sometimes require additional cooling equipment, such as heavy duty fans which increase the volume of air through the radiator, and/or pressure caps for the radiator which raise the boiling point of the coolant approximately seven degrees.

d. Proper Driving.

Heavy duty truck operation or mountain driving requires operation through whatever transmission gear ratio is required to keep the engine from lugging. By using the higher ratios, the engine speed and consequently the fan speed and water circulation are increased, thus providing adequate cooling.

e. Antifreeze.

Heavy duty operation or north and south runs require the use of ethylene glycol antifreeze rather than alcohol. This raises the boiling point of the coolant from 160°F. to 212°F. and eliminates overheating attributable to loss of coolant due to evaporation of the alcohol.

2. PROCEDURE.

a. Correct External Leakage.

Fill the cooling system and idle the engine. Inspect for leakage at all hoses and hose connections, and tighten connections or replace hose as required. Inspect the radiator cap for tightness and the condition of the gasket. If leakage is observed at the cylinder head gaskets, replace the gaskets (including remove carbon). Inspect the radiator for leakage, and repair or replace if required. Rust spots or wet spots on the radiator core are an indication of radiator leakage, even though there is no dripping.

b. Adjust the Fan and/or Generator Belt.

Adjust or replace the fan and/or generator belt if required.

c. Check Exhaust System.

Inspect the exhaust pipes, muffler, and tail pipe for evidence of dents, kinks, collapse, or restrictions of any kind. Make any necessary corrections. Move the counterweight on the exhaust thermostat valve through the entire range of action. If the counterweight arm sticks in any position, or if the counterweight is loose on the shaft, the passage of exhaust gases may be restricted. Remove the exhaust thermostat valve assembly and free up the action, or, if necessary, replace the unit.

d. Clean Radiator Core.

If the air flow through the radiator is restricted (insects, leaves, grease, dirt, etc.), clean the fins and air passages.

e. Time Ignition.

Time the ignition including adjust the vacuum brake and check spark advance. (Opr. 12000-B).

f. Check Radiator Hose.

Inspect the radiator hoses and replace any hose that has become soft or collapsed.

g. Check Thermostats.

Remove each thermostat and place in hot water. Thermostats should start to open at 150°F. to 155F°., and be fully opened at 170°F. (High temperature thermostats used in connection with hot water heaters open at slightly higher temperature.) Replace any faulty thermostats.

h. Flush Cooling System.

Use Cooling System Cleaner Kit, Part Number 81A-18442, according to directions on the container.

i. Check for Internal Leakage.

Drain the oil from the engine oil pan and observe if there is water in the oil. If an abnormal amount of water is found in the oil, remove the spark plugs and observe if water is present at the plug holes. With the engine cold, fill the radiator to the top. Remove the fan belt so that the water pumps will not operate. Run the engine at fast idle for 60 seconds. If water runs out of the radiator filler pipe or overflow, or if bubbles come to the surface of the water in the radiator, leakage exists between one or more of the cylinders and the cooling system. If leakage is evident from any of these inspections, check the cylinder head nuts, using a torque wrench. If the nuts do not show signs of looseness, remove the cylinder head and inspect for faulty gaskets or heads, and examine for cracks in the cylinder block usually found in the vicinity of the valve ports. Replace the cylinder head gaskets or make necessary corrections in case of a cracked block. When installing the heads, tighten to the recommended torque.

3. ADDITIONAL POSSIBLE CAUSES.

a. Lime Deposits.

If the engine continues to overheat, remove the cylinder heads and inspect the water openings in the cylinder heads and cylinder block for excessive lime deposits. If excessive lime deposits are present, the cylinder block and heads must be replaced as flushing will not remove lime deposits.

NOTE: *Excessive deposits of lime are the result of using hard water having a high mineral content in the cooling system. Recommend the use of soft or rain water.*

Symptom 8999-B

Engine Fails to Reach Normal Operating Temperatures

1. PRELIMINARY.

With the ignition OFF the temperature gauge should read HOT. Turn the ignition ON. If the gauge now reads COLD, proceed with par. 2. If the gauge still reads HOT, the temperature gauge circuit is open.

2. PROCEDURE.

Start the engine and allow it to idle. Cover the front of the radiator core until the engine temperature is at least normal. If the gauge still reads COLD, the sending unit is at fault.

a. If, by the above procedure, it is determined that the gauge is not at fault, remove and test the thermostats which are probably not closing.

b. If the thermostats are in good condition but the engine still fails to reach operating temperature or fails to heat in reasonable time, the exhaust thermostat valve may be faulty. Remove and inspect the valve; replace the unit if not in good condition.

Fits, Tolerances, and Wear Limits

9002—FUEL TANK

Part Number	Capacity (Gallons)
B-9002	10
BB-9002-A	17
40-9002	11
51-9002-A	17
51-9002-E	17
51-9002-F	17
67-9002	14
68-9002	14
79-9002-D	10
81A-9002	14
81D-9002	45
81W-9002	22
81Y-9002-A	17
81Y-9002-B	17
01A-9002	17
01T-9002-A	17
09B-9002	60
21A-9002-A	17
21A-9002-B	17
21C-9002-A	17
21C-9002-B	17
594T-9002	25
H-9002-A	20
06H-9002	19½
16H-9002	19½
7R4T-9002	30
7RT-9002	25
7C-9002	20
7HC-9002	17½

9350—FUEL PUMP

Part Number	Pressure (Pounds)	Vacuum (Inches)
B-9350	1½-3½	10
40-9350	1½-3½	10
52-9350-B	1½-3½	10
68-9350	1½-3½	10
11A-9350	1½-3½	10
19B-9350-B	1½-3½	10
1GA-9350	1½-3½	10
1NC-9350	1½-3½	10
49B-9350-A	1½-3½	10
49B-9350-B	1½-3½	10
26H-9350-A	1½-3½	10
26H-9350-B	1½-3½	10
7HA-9350	4 -5	10½
8CM-9350	3½-4½	10½
8EL-9350-E	3½-4½	10½
8EQ-9350	3½-4½	10½

9380—ROCKER ARM SPRING

Part Number	Spring Pressure Compressed to 0.81 inch	
	Maximum (Pounds)	Minimum (Pounds)
B-9380	7.25	6.75
40-9380	7.25	6.75
49B-9380-A	14	10
49B-9380-B	14	10
8EL-9380	13 at 0.68	—
8CM-9380	13 at 0.68	—

9396—DIAPHRAGM SPRING FUEL PUMP

Part Number	Spring Pressure Compressed to 0.625 inch	
	Maximum (Pounds)	Minimum (Pounds)
B-9396	7.4	6.12
40-9396	8.6	7.10
49-9396-A	18	10
49-9396-B	21	18
26H-9396	10.4	10.4
8CM-9396	11.5 at 0.590	10.5 at 0.590
8EL-9396	25 at 0.560	23 at 0.560
8EQ-9396	25 at 0.560	23 at 0.560
7HA-9396	16	15

9100—FUEL PUMP PUSH ROD

Part Number	Mfg. Length (Inches)	Wear Limit Length (Inches)
18-9400-A	6.541	6.535
18-9400-B	8.095	8.089
48-9400-A	8.872	8.866
48-9400-B	7.872	7.866
52-9400-A	5.620	5.614
52-9400-B	5.370	5.364
86H-9400	8.872	8.866
26H-9400	8.872	8.866
8EL-9400-B	11.700-11.706	11.694
8EQ-9400-B	11.700-11.706	11.694

9510—CARBURETOR

Part Number	Main Metering Jet Sizes (Inches)			Float Setting Using Float Level Gauge (Inches)	Power Valve Identification Mark	Nozzle Bar Part Number	Idle Tube Identification Mark	Pump Discharge Nozzle Identification Mark	Pump Link Identification Mark
	Standard	5,000 to 10,000 ft. Altitude	10,000 to 15,000 ft. Altitude						
52-9510-B	0.035	0.033	0.031	0.469-0.531*					
67-9510-A	0.045	0.043	0.041	0.469-0.531*					
922A-9510-A	0.035	0.033	0.031	1.322-1.353		922A-9922-23		71	C
ONY-9510	Adjustable Jet			0.234-0.266					
19B-9510-B	0.050	0.048	0.046	1.322-1.353		91A-9922-23B		69	C
1GA-9510-A	0.064	0.062	0.061	1.322-1.353		1GA-9920	99		E
5GA-9510-A	0.065	0.063	0.061	1.322-1.353		1GA-9920	64		E
21A-9510-A	0.050	0.048	0.046	1.322-1.353		91A-9922-23		69	C
59A-9510-A	0.051	0.049	0.047	1.322-1.353		91A-9922-23B		69	C
H-9510-A1	0.052	0.050	0.048	0.469-0.531*					
H-9510-A3	0.052	0.050	0.048	1.322-1.353	A	91A-9922-23	64	69	C
86H-9510-A1	0.052	0.050	0.048	0.469-0.531*					
86H-9510-A2	0.054	0.052	0.050	1.260-1.290	A	91A-9122-23	64	69	C
06H-9510	0.054	0.052	0.050	1.260-1.290	A	06H-9922-23	64	69	C
16H-9510-B	0.054	0.052	0.050	1.260-1.290	A	06H-9922-23	64	69	D
26H-9510-C	0.057	0.054	0.052	1.260-1.290	A	06H-9923-23	54	69	D
7RA-9510	0.050	0.048	0.046	1.322-1.353		91A-9922-23	54	69	C
7HA-9510	0.065	0.063	0.061	1.322-1.353		1GA-9920			E
8EL-9510	0.054	0.052	0.050	0.500±0.032*	52	—	54	70	108
8EQ-9510	0.054	0.052	0.050	0.500±0.032*	52	—	54	70	141
8CM-9510	0.048	0.046	0.044	0.500±0.032*	52	—	54	70	164

*Measurement is from top of float bowl to surface of fuel.

April 18, 1948

9518—IDLE DISCHARGE HOLES

Part Number	Upper Hole		Lower Hole	
	Drill Number	Size (Inches)	Drill Number	Size (Inches)
922A-9518	68	0.031	66	0.033
26H-9518	60	0.040	60	0.040
78-9518	65	0.035	60	0.040
1GA-9518	53	0.0595	—	—
8EL-9518	59	0.041	56	0.046
8EQ-9518	59	0.041	56	0.0465
8CM-9518	63	0.037	63	0.037

9581—THROTTLE SHAFT

Part Number	Mfg. Diameter (Inches)	Wear Limit Diameter (Inches)
18-9581	0.310-0.311	0.206
67-9581	0.247-0.249	0.243
ONY-9581	0.247-0.248	0.243
8EQ-9581	Ball Bearing	—
8EL-9581	0.276-0.277	0.272
8CM-9581	0.276-0.277	0.272

9636—ACCELERATOR PUMP RETURN SPRING

Part Number	Length	Size of Wire (Inches)	Number of Coils
40-9636	1.125-1.375	0.035	11
52-9636	1.125-1.375	0.035	11
78-9636	2.810-2.940	0.035	22
922A-9636	2.810-2.940	0.029	22
1GA-9636	2.810-2.940	0.032	22
8EL-9636	2.810-2.940	0.032	22
8EQ-9636	2.810-2.940	0.032	22
8CM-9636	2.810-2.940	0.032	22

17175—DIAPHRAGM SPRING VACUUM PUMP

Part Number	Spring Pressure Compressed (Inches)	
	Maximum (Pounds)	Minimum (Pounds)
8CM-17175	28 at 1.720	24 at 1.720
8EL-17175	64 at 1.810	56 at 1.810
8EQ-18175	64 at 1.810	56 at 1.810

ENGINE GOVERNED SPEED

Vehicle Model	No Load Cut-off R.P.M.
F-8—Truck	3600
F-7—Truck	3600

PRINTED IN U.S.A.

April 28, 1948

Every act performed on an owner's car, and every bit of advice or counsel given to an owner, is either good service or no service. There can never be a compromise between the two extremes for as soon as the owner fails to benefit, the seller of service stands without anything to sell.

April 28, 1948

Fuel Pump

OPERATING PRINCIPLES

Rotation of the camshaft eccentric lifts the push rod, thus actuating the rocker arm (on 6-cylinder engines the rocker arm bears directly on the camshaft eccentric), which in turn pulls the link and diaphragm assembly downward against the pressure spring.

On the suction stroke of the pump, fuel enters through pump inlet into the sediment chamber, and then passes through the strainer and inlet valve into the pump chamber. On the return stroke, the pressure spring pushes the diaphragm upward, forcing fuel from the pump chamber through the outlet valve and outlet line to the carburetor.

When the carburetor bowl is filled, the float in the carburetor will shut off the needle valve, thus creating a pressure in the pump chamber. This pressure will hold the diaphragm in the downward position until the carburetor requires additional fuel and the needle valve opens.

The suction stroke is positive and the discharge stroke of the pump is spring operated.

The stroke of the diaphragm is proportionate to the amount of fuel required by the carburetor.

The pumps require no priming and little attention other than the keeping of all the connections tight and the draining of such water and sediment as may collect in the sediment chamber.

Changes

Several changes have been made in the Ford V-8 fuel pump. However, the most notable change was that made approximately January 1, 1934, in which the pump mounting flange location was changed from parallel to the diaphragm to at right angles to it.

Fig. 1 illustrates the method in which the later pumps are mounted on intake manifolds intended for the previous design fuel pumps.

Engines now in production are equipped with fuel pumps incorporating a glass sediment bowl, which is secured to the pump by a bail wire and nut.

FUEL PUMP SERVICE OPERATIONS

Fuel pump inspections are an important part of the tune-up procedure. However, in addition to this, the mechanic often has occasion to test, repair or replace the fuel pump even though a complete tune-up is not made.

Complaints

Complaints will usually be either that the fuel pump will not prime itself or that it does not supply sufficient fuel to the carburetor.

Failure to prime is apt to inconvenience the owner should he run out of gasoline and then, after adding gasoline to the tank, the fuel pump does not permit him to again start his engine.

Failure to supply fuel can be caused by leaking or obstructed fuel line, especially flexible line between engine and fuel line, dirty screen, loose valve plug, dirty or warped valves, worn or punctured diaphragm.

Regardless of the complaint, the trouble will be revealed if you perform service operations in the following order, 9350-A, B, C, D, E, and F.

Operation 9350-A

VISUAL INSPECTION

1 Fuel leakage through the vent hole in the fuel pump body indicates leakage of the diaphragm; proceed with operation 9350-F.

2 Fuel leakage at edge of diaphragm is usually caused by loose cover screws which should be tightened. Also check inlet and outlet connections for leaks.

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April 8, 1948

Operation 9350-B

DRAIN SEDIMENT

1 Use drain valve or screw to drain water and other foreign material from sediment chamber. On pumps provided with a glass sediment bowl, loosen the bail nut and remove the bowl for cleaning.

2 When an excessive amount of water or sediment is found in the sediment chamber of the pump, it is advisable to also drain off from the fuel tank such water or sediment as has accumulated.

3 Reinstall drain plug (or screw), making sure that it is properly seated. If the drain plug is not properly seated, air will enter at this point during the intake stroke, preventing the pump from supplying sufficient fuel. On glass bowl pumps, install the bowl, using a new gasket. Tighten the bail nut securely.

Operation 9350-C

FUEL PRESSURE TEST

1 Connect the fuel pressure gauge to output side of fuel pump.

2 Start the engine without racing and observe pressure at idle speed.

3 Momentarily race the engine and observe pressure.

4 Refer to fuel specifications, Subject 9000 for correct pressure of the various pumps.

5 Low fuel pump pressure will limit engine performance; proceed with operation 9350-F.

6 High fuel pump pressure will result in high float level in the carburetor, high fuel consumption, and cause the engine to stall.

Operation 9350-D

FUEL PUMP VACUUM TEST

1 Connect vacuum gauge to fuel pump intake.

2 Start the engine and run it at idle speed.

3 The pump will start building up a vacuum which should advance until it reads at least 10.

4 After the gauge registers 10, stop the engine and observe the gauge.

5 The hand should fall slowly back at a rate which will not allow it to reach zero in less than one minute.

6 A faster rate of fall indicates a poor fuel pump intake valve condition; proceed with operation 9350-F.

7 Before replacing connections, blow through fuel line to clear any obstructions.

Operation 9350-E

PRIMING TEST ON THE CAR

1 Disconnect the fuel pump intake connection. This will permit fuel in the line to run back into the tank.

2 Run the engine until it stops due to fuel in carburetor being used up.

3 Reconnect intake connection.

4 Start the engine. A fuel pump in good condition will prime itself. That is, the engine will start, or if the discharge line is disconnected, will show a flow of fuel at the outlet of the pump in about twenty seconds or less when the starter is cranking the engine.

April 8, 1948

Operation 9350-F

CLEAN SCREEN AND INSPECT

1 Remove fuel pump cover (on Lincoln cars the sediment chamber and screen are separate from the pump).

2 Remove and clean screen.

3 Remove any accumulation of sediment that has failed to drain from the sediment chamber.

4 If during operation 9350-A leakage was found at vent hole in the body of the fuel pump, examine diaphragm pull rod gasket, and make sure the nut is tight. If leakage has not been occurring at this point, diaphragm is either worn or punctured.

5 Examine both intake and exhaust valves for proper seating, being sure that valve plug gasket is in good condition and tight when reassembled.

6 Reinstall screen, making sure gasket is in good condition.

7 Reinstall cover, making sure gaskets are properly seated.

8 Make sure drain plug is tight.

The information contained in these bulletins will prove of much value to salesmen, as well as to servicemen.

The opportunity here presented of keeping up with mechanical changes should not be overlooked.

April 8, 1948

Fuel Pump And Vacuum Booster

OPERATING PRINCIPLES—FUEL PUMP

Rotation of the camshaft eccentric lifts the push rod to actuate the rocker arm "A" which pulls the link "B" and diaphragm "C" downward against spring pressure "D" which creates a vacuum in the pump chamber "E" (fig. 1).

On the suction stroke of the pump, fuel from the gas tank enters through the inlet into the sediment bowl "F" and passes through the strainer "G" and then through the inlet valve "H" into the pump chamber "E".

On the return stroke, spring pressure "D" pushed the diaphragm upward, forcing the fuel from the chamber "E" through the outlet valve "J" and through chamber "K" to the carburetor.

When the carburetor bowl is filled to the correct level, the float valve will close, thus creating a pressure in the pump chamber "E". This pressure holds the diaphragm "C" downward against spring pressure "D" where it will remain inoperative in the downward position until the carburetor requires further fuel and the float opens the float valve.

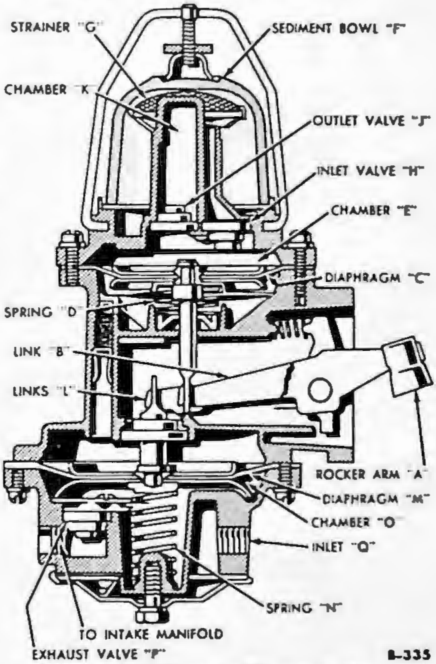

Fig. 1—Fuel Pump And Vacuum Booster

OPERATING PRINCIPLES—VACUUM PUMP

The rocker arm "A", actuated by the pump push rod, moves the two links "L" to which the booster diaphragm "M" is hooked, downward against the diaphragm spring "N", which expels the air in the lower pump chamber "O" through the exhaust valve "P" and through the line to the intake manifold. On the return stroke, the spring moves the diaphragm upward, creating a suction in the pump chamber "O", opening the intake valve and drawing air through the inlet line "Q" from the windshield wiper.

When the windshield wiper is not being used, the manifold vacuum holds the diaphragm down against the spring pressure so that the diaphragm does not make a complete stroke for every stroke of the rocker arm. When the manifold vacuum is greater than the vacuum created by the pump, the air will flow from the windshield wiper through both pump valves, and the operation of the wiper will be the same as if there were no vacuum pump.

When the intake manifold vacuum is low, that is, when the vehicle is accelerating or operating under full load, the vacuum created by the pump will be greater than the manifold vacuum, and the pump will operate the wiper.

For repair procedure, refer to Fuel System Repair Manual, Form 3675. For pump specifications, refer to Fuel System Specifications, Subject No. 9000.

Good service is quick service, for if the owner's loss of time offsets the value of good work performed, he is not getting good service.

April 8, 1948

SELECTO-MATIC CARBURETOR CHOKE

Description

The Selecto-Matic Choke is a device which, through the medium of an electric magnet "solenoid" and a thermostat which automatically closes the carburetor choke valve for cold engine starting and also regulates its degree of opening as the engine warms.

The unit is mounted on the intake manifold and a small rod connects it to the carburetor choke lever. A wire from the starter solenoid switch is connected to the magnet in the choke unit.

When the starter is operated, current flows to the magnet, and an armature lever is energized, closing the carburetor choke valve.

The device gives a full or partial carburetor choke, according to engine temperature. If the engine is hot; the automatic choke is inoperative.

As soon as the engine starts and the starter circuit is broken, the electro magnet in the unit is de-energized and the thermostat takes up the burden of automatically adjusting the carburetor choke valve during the "warming up" period.

A **dual control button** located on the instrument panel permits the driver to choose which choke control he wished to use, either automatic or manual.

When the "A" on the button is turned upward, the choke is operating automatically.

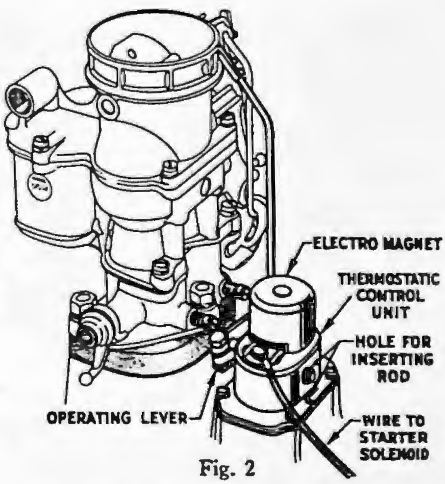

Fig. 2

When the "M" on the button is turned up, it permits complete control by the driver and eliminates entirely the automatic feature. (See Figs. 1 and 3.)

Fig. 1 shows the automatic position of the choke button.

Fig. 3 shows the manual position of the choke button.

When starting, depress accelerator slightly.

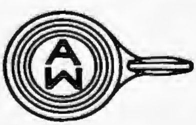

Fig. 1

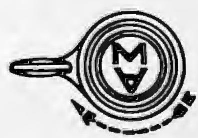

Fig. 3

ABOVE APPLIES TO MODELS:
LINCOLN—CUSTOM
LINCOLN—CONTINENTAL

June 6, 1941

If desired manual choke may be used by rotating lever clockwise to the left, as shown in Fig. 3, and depressing accelerator slightly before pulling choke button.

Adjustment

The only adjustment required is the position of the operating lever on the thermostatic control unit.

1 Move the lever until the hole in the brass shaft lines up with the slot in the bearing, and insert a $^5/_{64}$ in. rod through the hole in the shaft and all the way down to the notch in the base of the unit.

2 Loosen clamp screw on the lever and push the lever upward until the carburetor choke valve is closed tight against a .010 feeler.

3 The air cleaner must be removed to determine if the choke valve is fully closed.

4 Hold the lever in this position and tighten clamp screw in the lever, then remove rod from the hole on the opposite end of the shaft. (See Fig. 2.)

Poor work performed gratis is not good service.

ABOVE APPLIES TO MODELS:
LINCOLN—CUSTOM
LINCOLN—CONTINENTAL

June 6, 1941

Printed in U.S.A.

Dual Concentric Carburetor

The Dual Concentric carburetor is of the plain tube dual downdraft type. All the main channels are located in the main body and air horn. The carburetor may be cleaned or serviced with standard hand tools.

The dual carburetor can be considered as two carburetors built into one unit. There is a separate set of venturi, idle tubes, throttle plates, main metering system and idle system for each side. There is one accelerating pump from which the fuel is divided at the pump discharge nozzle, one air chamber, and one fuel chamber. There is one power valve which takes the fuel from the fuel chamber through the power valve chamber and the high speed restriction into the main well where the fuel is evenly divided for each side. In the following general explanations, one barrel is referred to unless mentioned otherwise.

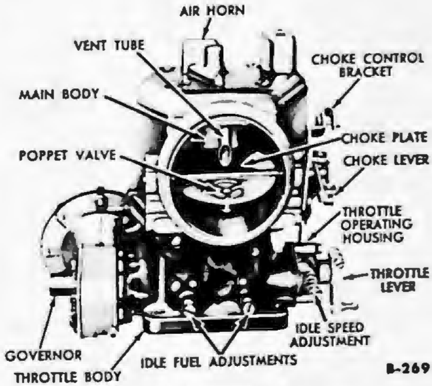

Fig. 1—Dual Concentric Carburetor

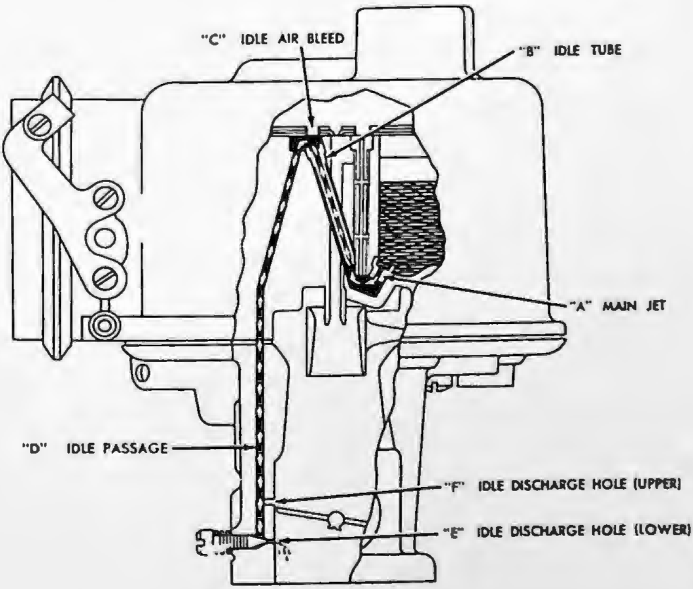

Fig. 2—Idle Fuel Supply

a. Idle Fuel Supply.

The fuel from the carburetor float bowl passes through the main metering jet "A" into the idle tube "B" as indicated by arrows in fig. 2. Air is introduced into the fuel stream by the idle air bleed "C." This fuel and air mixture then travels through the idle passage "D" to the idle discharge holes "E" and "F."

When the engine is set to an idle speed of 400 R.P.M., the mixture is discharged out of the lower idle discharge holes only. As the throttle plate opens and the engine speed is increased, the upper idle discharge holes begin to function. The upper holes very gradually start discharging at 700 R.P.M., in addition to the lower holes. The action and timing are such that the upper discharge holes gradually start to feed, reach a maximum at about 850 R.P.M., then gradually become less effective as the main nozzle starts to flow. The lower holes are provided with an idle mixture adjustment (fig. 1). Turning the needle valve out gives a richer mixture, and turning it in gives a leaner mixture. The idle adjustment should be set for the highest steady vacuum reading (refer to Test Equipment and Procedure). The idle adjustment needle valve should not be jammed against the seat hard enough to groove the point. If this occurs, the adjustment needle will have to be replaced in order to obtain a satisfactory idle adjustment.

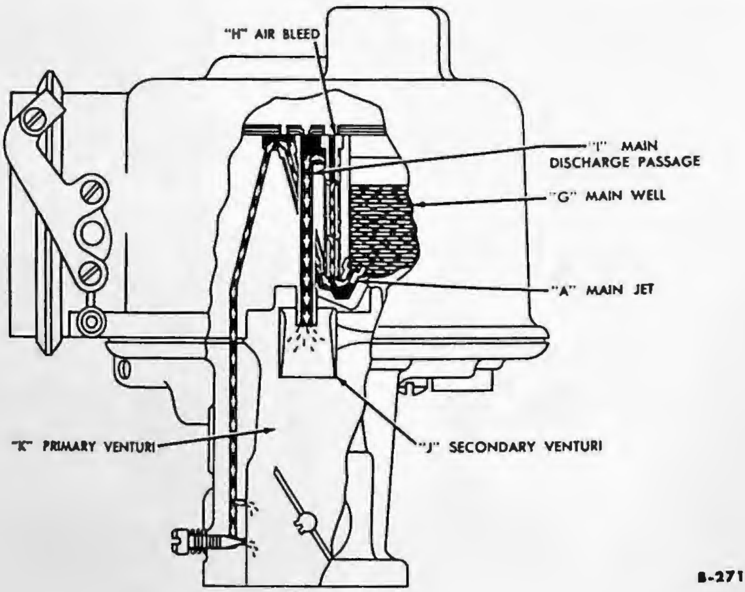

Fig. 3—Main Fuel Supply

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b. Main Fuel Supply.

As the idle fuel system becomes less effective, the main nozzle starts to deliver fuel. This occurs at about 850 R.P.M. Between 950 R.P.M. and 1050 R.P.M. a definite blending of the idle system and the main fuel system takes place. The power valve remains closed in this range. In the above range, all the fuel passes through the main jet "A" (fig. 3), up through the main well, around the main well tube, and to the main discharge "I." Air is added to the fuel here by the air bleed "H" and carries through the secondary venturi "J" to the primary venturi "K." The float bowl is vented to the atmosphere through a passage which is open to the vent tube shown in fig. 1. The main air supply for the secondary and the primary venturi is carried through the main air horn where it circulates around and under the float bowl. The fuel is kept cool by the circulation of air through the air horn in which the float bowl is located.

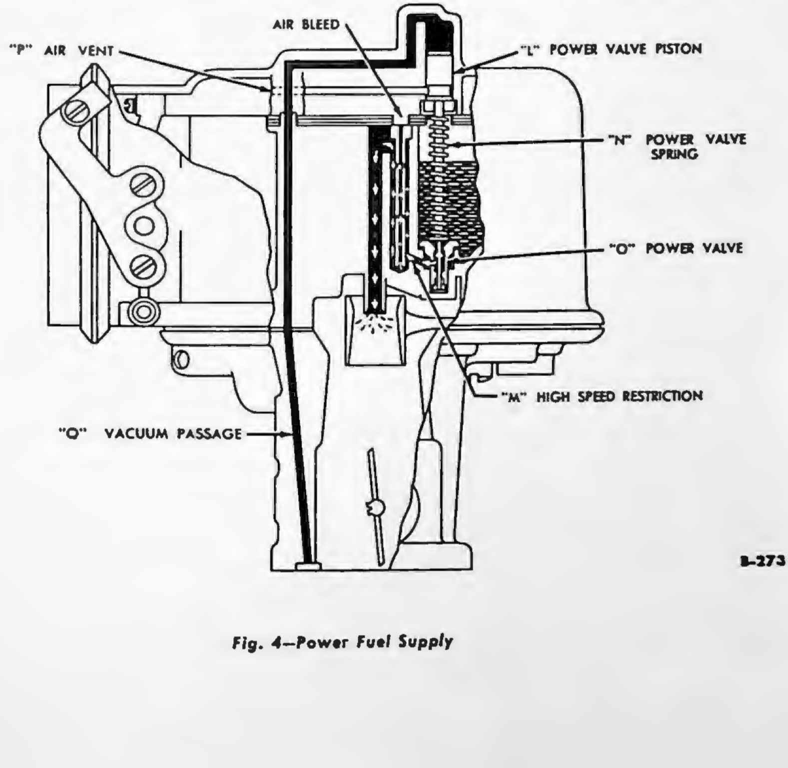

Fig. 4—Power Fuel Supply

c. Power Fuel Supply.

The power valve piston "L" (fig. 4) is actuated by the vacuum below the throttle plate through passage "Q" and the power valve spring "N." At idle, the vacuum is the highest and decreases as the load increases. The vacuum holds the piston in the UP position which allows the power valve "O" to remain closed until the vacuum drops to 7-5 inches of mercury. Below this vacuum, the piston force is not high enough to resist the compressed load of the spring and thus opens the power valve. The underside of the piston is vented to the air channel "P" to assure positive action. Under load, as in climbing hills, the vacuum drops because it becomes necessary to open the throttle wider in order to maintain speed. When the vacuum drops to 7-5 inches of mercury, the power valve "O" (fig. 4) is opened by the action of the piston and spring "L" and 'N." The fuel then flows into the power valve chamber and through the high speed restriction "M" into the main well. This gives the additional fuel required for high speeds and for heavy loads at full throttle and low speeds.

d. Accelerating Pump.

The accelerating pump is connected directly to the throttle linkage, and its function is to enrich the mixture temporarily for rapid acceleration. The fuel is drawn into the pump chamber "R" (fig. 5) through the pump inlet passage and the pump inlet ball check valve "S" on the up stroke of the pump piston when the throttle is closed. When the throttle is opened, the piston moves down, closing the pump check valve "S" and overcoming the weight of the pump discharge valve "T". The accelerating fuel then goes around the pump discharge valve needle and out the pump discharge jets "V." Free movement against a spring load is provided in the pump stem and the pump operating rod to give a prolonged discharge when the throttle is opened suddenly.

The accelerating pump is provided with an adjustment to vary the quantity of the accelerating charge. This adjustment is made by changing the position of the pump link "U." The position farthest away from the pivot point is the cold weather setting, since it gives the greatest discharge. The middle position is the average setting, and the position nearest the pivot point is used under conditions of very hot weather.

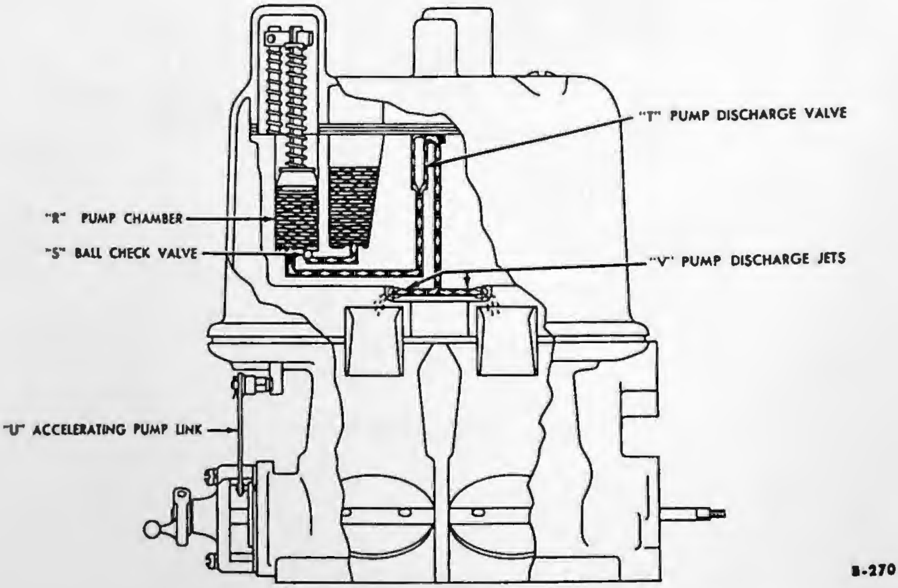

Fig. 5—Accelerating Fuel Supply

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Governor

The engine speed governor is made up of two units (fig. 6). The governor is vacuum controlled which eliminates the linkage required with a mechanical governor. Cleaning and servicing may be done with standard hand tools.

The control at the engine end of the governor consists of a governor valve assembly "A" and an adjusting screw "B" assembled in a rotor (fig. 6), which is mounted in a housing directly under the ignition distributor. The rotor and ignition distributor are driven by a common shaft "C".

The control at the carburetor end of the governor consists of a diaphragm "D" which is connected to the throttle shaft by a rod and governor lever "E". A tension spring "F" also attached to the governor lever, and anchored on a stud "G" in the governor housing, tends to hold the throttle open.

The diaphragm chamber is connected to the governor valve air bleed orifice "H" by means of a conventional pipe line. The air bleed supply enters the rotor body from a second pipe line to the carburetor. Vacuum to the diaphragm is supplied by two channels "I" and "J". One channel is below the throttle plate and the other channel is above the throttle plate. The two channels equalize the vacuum at the diaphragm, and are connected to a channel in which is located a restriction screw "K".

a. Governor Operation.

When the engine is at idle speed the throttle is controlled by the external lever "L" (fig. 6), on the throttle operating shaft. The throttle operating shaft is provided with a clutch "M" which engages the main throttle shaft. The clutch is so designed that when the accelerator is moved to the open position the governor takes over control of the throttle.

At low speed the governor valve "A" is held away from the air bleed orifice "H" by the spring "N" which is fastened to the governor adjusting screw "B". As the accelerator is moved to and held in the fully open position to increase the engine speed, the governor spring "F" pulls the throttle to the wide open position to remain there until the engine R.P.M. has reached the predetermined governor cut-off speed. At this point, the governor takes over control of the throttle, causing the accelerating pedal to become ineffective for further increase in engine speed. When the engine speed increases, the action of the mechanism is as follows: The governor valve "A" stretches the spring "N" and moves toward the air bleed orifice "H", thus restricting the air bleed to the diaphragm. As the air bleed to the diaphragm is reduced, it permits the suction from the orifices "I" and "J" to operate the diaphragm. As the suction increases, the diaphragm power overcomes the tension of the governor spring "F" and takes over full control of the throttle. The engine governed speed is then held constant by the valve "A", being balanced between the pull of centrifugal force actuated by the rotation of the rotor shaft and the tension of the spring "N".

Any slight change in speed will cause the governor valve to act immediately, either to increase or decrease the amount of air bleed through the orifice "H", which, in turn, causes an instantaneous response from the diaphragm to increase or decrease the throttle opening. When the accelerator is released, the control is taken away from the governor by the external lever "L", and the accelerator spring closes the throttle to bring the engine to any desired lower speed.

b. Governor Adjustment.

The governor adjustment is made at the factory and no further attention should be required. If, however, the factory setting has been changed for any reason, or if either a replacement governor or rotor assembly has been installed, it will be necessary to readjust the governor. Connect a tachometer to the engine, and adjust the governor to the no-load cut-off speed of 3600 R.P.M., as follows: Turn the ignition switch off and remove the seal wire from the rotor adjusting hole plug. Remove the plug and rotate the engine until the adjusting screw (fig. 6) in the end of the enclosed rotor is in line with the plug hole in the rotor body. Insert a screwdriver through the hole and turn the adjusting screw to the right to increase the governed speed or to the left to decrease the speed. One turn of the adjusting screw will affect the engine governed speed approximately 100 R.P.M. Replace the plug and start the engine, gradually increasing the throttle opening, while observing the tachometer, until the no-load cut-off speed is reached. If the cut-off is not within the 3600 R.P.M. range, stop the engine and make the necessary correction at the governor adjusting screw. Repeat the test for correct cut-off speed.

NOTE: *Before resealing the governor make sure the air bleed pipe union nuts and the adjusting hole plug are tight. Air entering the diaphragm from any source other than the rotor orifice will cause faulty governor control.*

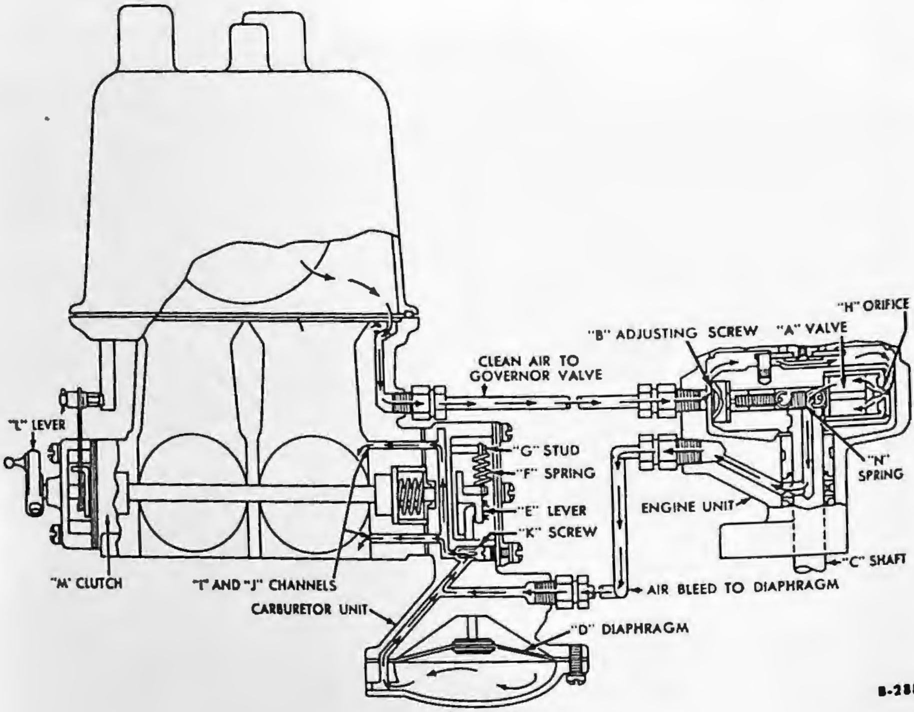

Fig. 6—Diagrammatic View of the Governor System

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4 CYL. CARBURETOR

Complete specifications for these carburetors will be found on specifications sheet.

The 4 cylinder carburetor is of the single up-draft type. These carburetors differ from the previous 4 cylinder carburetors chiefly in that the float chamber is not open to atmospheric pressure and at part throttle a partial vacuum in the float bowl reduces the quantity of the fuel used.

On the other hand with wide open throttle pressure in the float chamber increases which increases the flow of fuel having the same effect as the mechanical or vacuum actuated power valves in other carburetors.

CHOKE

The choke valve is mounted on an on center shaft and is equipped with a poppet valve to allow air to enter when the engine starts.

A drain opening is provided in the bottom of the carburetor to allow manifold condensation or excessive fuel collection to escape. This opening is tightly packed with curled hair and covered with a cup so dirt and dust cannot enter at this point.

IDLE FUEL SUPPLY

Fuel for idling passes through the jets "A" and "B" and up the passage "U" to the discharge holes "E" and "D" (see Fig. 1). Air enters the idle fuel supply at "W" as controlled by the idle mixture adjustment screw.

MAIN FUEL SUPPLY

Fuel for the main fuel supply enters the main fuel supply discharge tube "G" through the jets "A" and "B" and out the discharge tube in the center of the venturi.

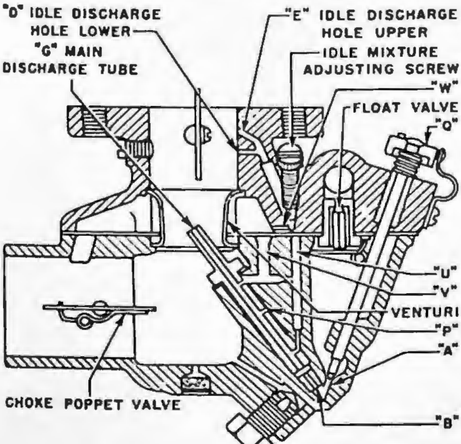


Fig. 1

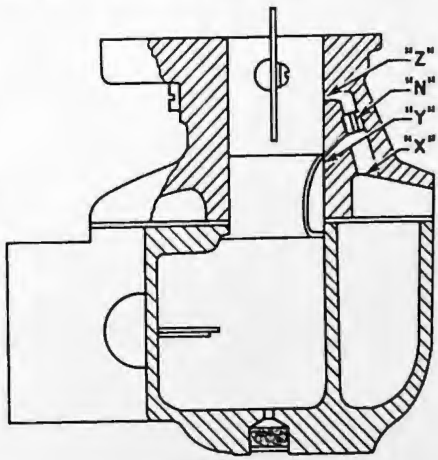


Fig. 2

EQUIPMENT USED

KRW—9550-D—FLOAT POSITION GAUGE
KRW—9530-A—SOCKET WRENCH

ABOVE APPLIES TO MODELS:

ALL 4 CYL.

July 1, 1941

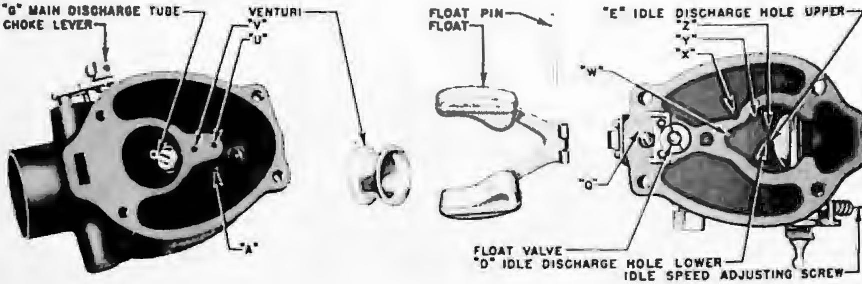


Fig. 3

Air is introduced into the main fuel supply in the form of bubbles through the small holes "P" in the main discharge tube.

The adjustment "Q" permits leaning of the mixture for constant speed and load operation. The valve seat at "A" is in itself a restriction so that even with the adjustment "Q" all the way out the mixture will not be overly rich.

On the other hand if the adjustment is turned all the way down the fuel supply will be completely shut off.

POWER OPERATION

As previously explained the float chamber is open to the carburetor throat and not to the outside atmosphere. This results in the air pressure being less than atmospheric pressure at all times. The amount of this difference in pressure is controlled by the throttle position and the speed of the engine.

Air enters the float chamber through the openings "X", "Y" and "Z" (see Figs. 2 and 3). This air is metered at "N" (see Fig. 2) in the part throttle position.

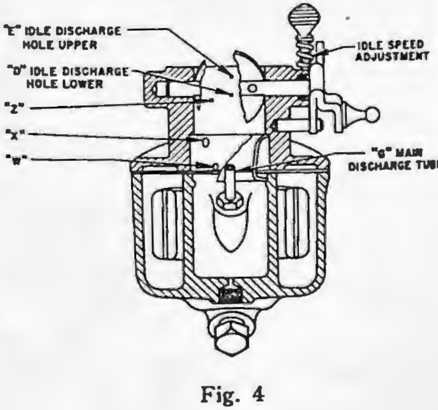


Fig. 4

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 4 CYL.	KRW—9550-D—FLOAT POSITION GAUGE KRW—9530-A—SOCKET WRENCH

July 1, 1941

Printed in U.S.A.

6 CYL. CARBURETOR

The Ford 6 cyl. carburetor is a single downdraft type similar to the dual downdraft carburetor used on the Ford V-8 as described starting on page 45.

For jet and venturi sizes see the specification section.

In this type all the main channels are carried in a removable nozzle bar (see insert Fig. 2) which carries the idle tube and an aspirating nozzle. (Aspiration means the act of breathing). The central portion of the nozzle bar forms the discharge nozzle. In this construction it is possible to locate the discharge nozzle in the center of the air stream without having attaching brackets or bosses which interfere with the flow of air into the venturi.

The discharge nozzle proper is located in the smallest part of the venturi, (see Fig. 1) is circular and of such diameter as to create a high suction at the end of the nozzle. This suction, in addition to the atomizing holes in the nozzle, helps to completely vaporize the fuel.

CHOKE

The choke valve is mounted on a shaft located off center in the air passage as shown in Fig. 1. A torsion spring "S" tends to close the choke valve when the choke lever is moved to the choke position. There is a certain amount of free movement in the mechanism at part choke position so that if the choke is partially closed to operate at a relatively low speed, the inrushing air at a higher speed will force the valve open and compensate for the increased speed.

This, however, does not mean that the car can or should be continuously operated with the choke control in part choked position. With full choke the valve is held in locked position by the control lever. If the choke is held in full closed position after the engine fires, a poppet valve or air bleeder "T" in the choke valve will open. This supplies enough air to keep the engine running and eliminates choke sensitivity.

The opening of this poppet valve and the rush of air flowing through it makes considerable noise, which should attract the owner's attention to the fact that the choke button is out and will continue to make this noise until the choke button is pushed either all the way in, or to a part choke position.

When the carburetor is choked the throttle valve is automatically open to the correct position for starting. For this reason it is neither necessary nor desirable for the operator to pull out the throttle button, or pump the accelerator when starting.

In full choke position, everything below the choke valve is subjected to intake manifold vacuum and the bulk of the fuel is supplied by the main discharge nozzles.

Fig. 4 shows the idle speed adjusting screw and part of the choke mechanism.

IDLE FUEL SUPPLY

The fuel from the carburetor bowl passes through the main metering jet into the idle tube "F" as indicated by the arrows in Fig. 1. Air is introduced into the fuel stream by the idle air bleed "A" and a small additional amount of air is bled in by a small hole "B" in the aspirating nozzle (see insert Fig. 1). The idle mixture goes around the aspirating nozzle by means of an undercut around its outside diameter as shown. The mixture then travels down the idle passages "C" to the idle discharge holes "D" and "E".

When the engine is running at a speed of 350 RPM, the mixture is discharged out of the lower hole "E" only. As the throttle plate opens and the speed is increased, the upper hole "D" starts discharging. In this carburetor

EQUIPMENT USED

KRW—9550-A—FLOAT POSITION GAUGE

ABOVE APPLIES TO MODELS:

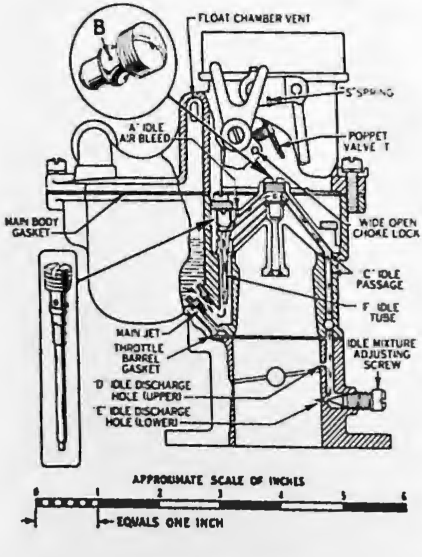
ALL 6 CYL.

the lower hole only discharges from idle to about 450 RPM. The upper hole very gradually starts discharging, in addition to the lower hole, from about 450 RPM to 1250 RPM. The action and timing are such that the upper discharge hole gradually starts to feed, reaches a maximum about 750 RPM and then gradually become less effective as the main nozzle starts.

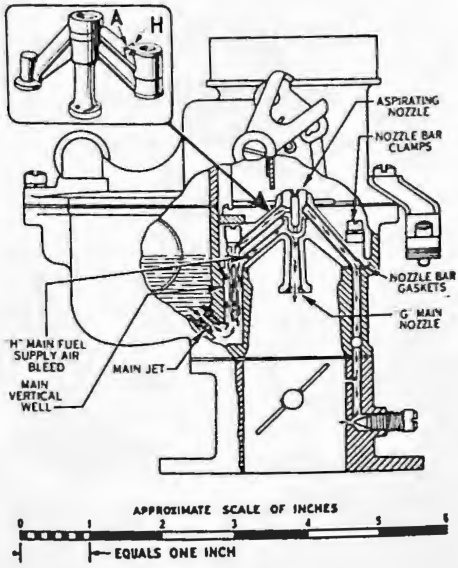
The lower discharge hole is provided with an idle mixture adjustment. Turning the needle out gives a richer mixture and in, a leaner mixture. The idle adjustments should be set with a tachometer or for the highest and steadiest vacuum reading. The idle adjustment should not be jammed against the seat hard enough to groove the point. If this occurs the adjusting screws will have to be replaced in order to obtain a satisfactory idle adjustment.

MAIN FUEL SUPPLY

As the idle system becomes less effective, the main nozzle "G" starts to deliver fuel. This occurs at about 900 RPM. Between 900 RPM and 1250 RPM there is a definite blend of the idle system and the main metering system. The power valve remains closed in this range, and approximately up to 3800 RPM except under load which cause manifold vacuum to drop. In this range all the fuel passes through the main jet, as shown in Fig. 2, up through the main vertical well, then



Idle Fuel Supply
Fig. 1



Main Fuel Supply
Fig. 2

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 6 CYL.	KRW—9550-A FLOAT POSITION GAUGE

May 20, 1941

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6 Cyl. Carburetor (Cont.)

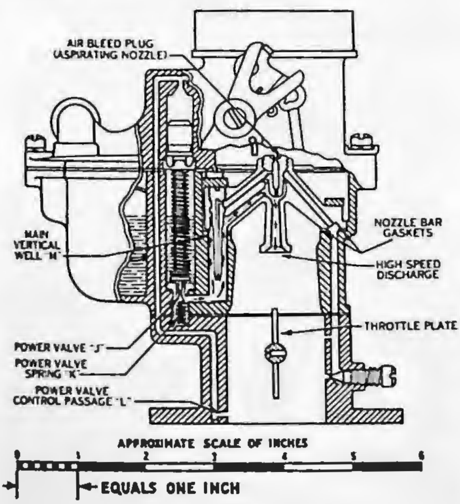
up and around the idle tube. The main fuel is emulsified by air entering at the main fuel supply air bleed "H" which lightens the fuel and makes the mixture more reponsive to throttle changes. The mixture is again aspirated by the aspirating nozzle as it starts down the main nozzle "G".

The nozzle bar is held in place by clamps and the channels sealed against leaks by the nozzle bar gaskets. In disassembling and assembling these nozzles bars, care should be taken to see that the gaskets are in place and in good condition and that the clamp screws are tight. When removing jets, be sure a screw driver which fits the slot is used. This will eliminate the danger of slipping and damaging the metering orifice.

The power valve "J" (shown in Fig. 3) is operated by the vacuum below the throttle plate through passage "L" and the power valve spring "K". At idle, the vacuum is the highest and decreases as the load increases. With high vacuum the piston is held in the up position and the power jet spring holds the valve closed.

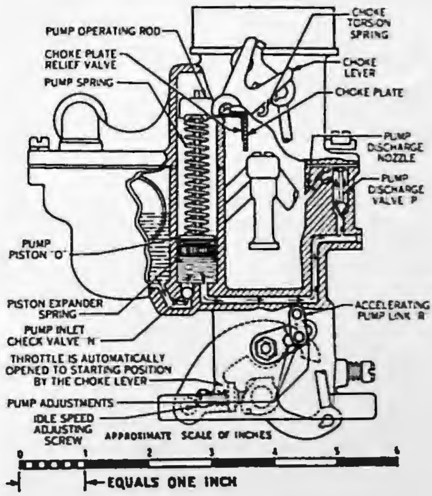
With low vacuum the spring on the piston rod pushes the end of the rod against the power jet valve opening it.

The power jet valve remains on its seat until the vacuum drops to from 8½ to 9



Power Fuel Supply

Fig. 3



Acceleration Fuel Supply

Fig. 4

EQUIPMENT USED
KRW—9550-A FLOAT POSITION GAUGE

ABOVE APPLIES TO MODELS:
ALL 6 CYL.

inches of mercury where it is not high enough to resist the action of the spring. This point at level road running at a constant speed is approximately 3800 RPM.

Under load as in climbing hills, etc., the vacuum drops as it becomes necessary to open the throttle wider in order to maintain speed. When the vacuum drops to from 8½ to 9 inches of mercury the power valve is opened by the spring the same as when the engine speed exceeds 3800 RPM on level road and the fuel then flows into the power valve and channels and through the high speed gas restrictions into the center or main vertical well "M", as shown by the arrows in Fig. 3. This gives the additional fuel required for high speeds and for heavy loads at full throttle and low speeds.

ACCELERATING PUMP

The accelerating pump is directly connected to the throttle and its function is to slightly enrich the mixture for rapid acceleration. Referring to Fig. 4, fuel is drawn into the pump chamber through the pump inlet check valve "N" on the up-stroke of the pump piston (closing the throttle). When the throttle is opened the piston "O" moves down closing the pump inlet check valve and overcoming the weight of the pump discharge valve needle. The accelerating fuel then goes around the pump discharge valve "P" and out the pump discharge nozzle. Free movement against a spring load is provided in the pump piston stem and the pump operating rod to give a prolonged discharge when the throttle is opened suddenly.

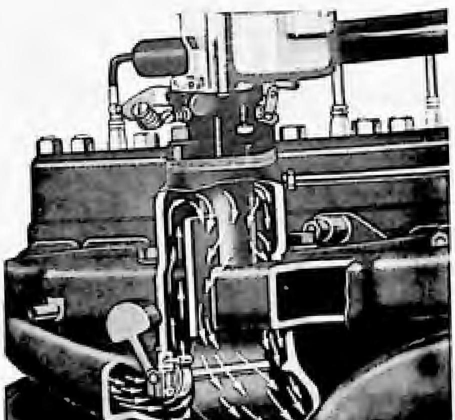
The accelerating pump is provided with an adjustment for varying the quantity of the accelerating charge. This adjustment is made by changing the position of the pump link "R". The positions are marked 1, 2 and 3. Number 2 is the average setting; Number 1 the summer or hot weather setting, and Number 3 the extremely cold weather setting.

Failure of the accelerating pump is mostly due to dirt in the pump inlet check ball seat. This **can be checked by removing** the carburetor **air horn and operating** the **pump** with just a small amount of fuel in the bowl. **If** the **check is leaking, air or fuel will bubble back into the fuel bowl from** the **inlet hole.** When cleaning this seat care should be used in re-installing the pump piston to be sure the leather is not damaged.

EXHAUST THERMOSTAT

An exhaust thermostat is used in the Ford 6 cylinder car to assure quick warm up in all kinds of weather. When this thermostat is closed the exhaust gasses from the rear cylinders are bypassed through the passages shown in Fig. 5 where they heat the intake manifold thus assuring good vaporization of the fuel.

When the thermostat valve is open these gasses go directly to the exhaust pipe along with the exhaust gasses from the other cylinders.



6 Cyl. Exhaust Thermostat
Fig. 5

ABOVE APPLIES TO MODELS:

ALL 6 CYL.

EQUIPMENT USED

KRW—9550-A FLOAT POSITION GAUGE

CARBURETOR PARTS IDENTIFICATION

Many carburetor parts are similar in appearance yet they are not interchangeable for the various carburetors.

The following illustrations indicate the differences in parts which are similar and the location of their identification marks. These bulletin sheets can be used for reference when sorting parts.

Dealers who recondition carburetors should provide a small bin for each part which is to be reused. The front of each bin should be labeled with the part number of the part. A sample part attached to the front of a bin will also be beneficial for reference when sorting carburetor parts.

Nozzle Bars (fig. 1)

1. Bars having a **large main fuel passage** (0.160") are to be stocked under part number 78-9922-23.

2. Bars having a **small** bottom **skirt** (0.375") are to be stocked under part number 26H-9922-23.

3. Bars having **no extension** on the side are to be stocked under part number 1GA-9920.

4. Bars having a **countersink at one air bleeder hole and** a **large** bottom **skirt** (0.437") are to be stocked under part number 06H-9922-23.

5. Bars having **no countersink** at the air bleeder hole **and have** an **extension** on the side of the bars are to be stocked under part number 91A-9922-23.

6. Bars having an **indentation between** the bleeder **holes** are to be stocked under part number 922A-9922-23.

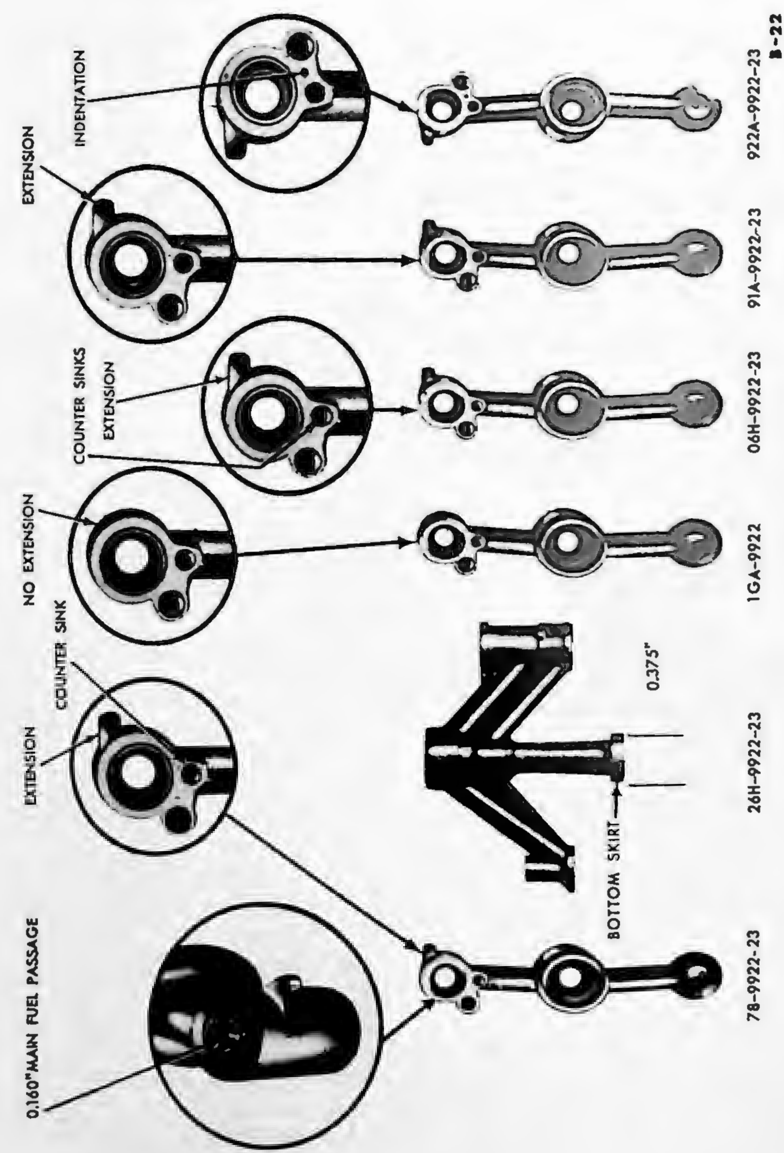
NOZZLE BAR IDENTIFICATION CHART

Carburetor Part Number	Nozzle Bar Part Number	Size of Main Fuel Passage	Countersink At Air Bleeder Holes	Indentation Between Air Bleeder Holes	Size of Bottom Skirt	Extension on Side of Nozzle Bars
78-9510	78-9922-23	0.160"	None	None	0.437"	Yes
91A-9510	91A-9922-23	0.098"	None	None	0.437"	Yes
21A-9510	91A-9922-23	0.098"	None	None	0.437"	Yes
922A-9510	922A-9922-23	0.086"	1 Hole	Yes	0.437"	Yes
1GA-9510	1GA-9920	0.131"	*1 Hole	None	0.437"	None
H-9510	06H-9922-23	0.098"	None	None	0.437"	Yes
86H-9510	06H-9922-23	0.098"	None	None	0.437"	Yes
06H-9510	06H-9922-23	0.096"	1 Hole	None	0.437"	Yes
16H-9510-A	06H-9922-23	0.096"	1 Hole	None	0.437"	Yes
16H-9510-B	06H-9922-23	0.096"	1 Hole	None	0.437"	Yes
16H-9510-C	06H-9922-23	0.096"	1 Hole	None	0.437"	Yes
26H-9510-C	26H-9922-23	0.096"	2 Holes	None	0.375"	Yes
26H-9510-D	26H-9922-23	0.096"	2 Holes	None	0.375"	Yes

*1941 Carburetors have a countersink at one bleeder bole. 1942 Carburetors have a countersink at both bleeder holes, however, they are interchangeable.

Printed in U.S.A.

April 25, 1945



Nozzle Bars
Fig. 1

Carburetor Parts Identification (Cont'd)

Air Bleeder Plug for Nozzle Bar (fig. 2).

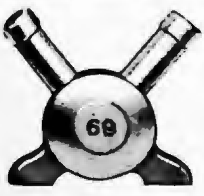
Two types of nozzle bar bleeder plugs are used. The bleeder plugs having a skirt are used in all nozzle bars for the Ford V8 and Lincoln carburetors. The bleeder plug without the skirt is used in the GA-9510 carburetor for the 6-cylinder engine.

AIR BLEEDER PLUGS
Fig. 2

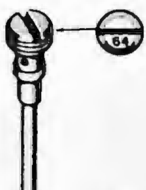
Pump Discharge Nozzle

The carburetor pump discharge nozzle has an identification number stamped on it at the location shown in figure 3. The correct nozzle for the various carburetor models are as follows:

Discharge Nozzle Part Number	Identification Mark	Carburetor Part Number Prefix
78-9577	69	78, 91A, 21A, 86H, 06H, 16H, 26H
922A-9577	71	922A



PUMP DISCHARGE NOZZLE
Fig. 3



IDLE TUBE
Fig. 4

Idle Tubes

The idle tube jets stamped with figure "99" are to be used on the 6-cylinder carburetor for 1941 production only. Jets stamped with figure "64" are for use on the 1942 6-cylinder and all Lincoln Zephyr carburetors. (Fig. 4) Jets with no identification mark are used on all Ford V8 carburetors.

Pump Springs

The carburetor pump spring for the various carburetors can be identified by the diameter of the wire in the spring. The wire diameter can be measured with a micrometer as shown in figure 5.

The diameter of the pump spring wire for the various carburetors are as follows:

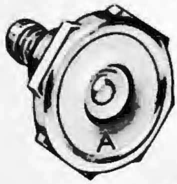
Spring Part Number	Wire Size	Carburetor Part Number Prefix
78-9636	0.035"	78, 91A, 21A, 86H, 06H, 16H, 26H
91A-9636	0.029"	922A
1GA-9636	0.032"	1GA

MEASURING PUMP SPRING WIRE
Fig. 5

Economizer Valve

The vacuum operated economizer valve 96H-9904 for the Lincoln Zephyr carburetors have a letter "A" stamped as shown in figure 6.

The economizer valve part number 78-9904 is the same on all carburetors for the V8 engine and has no identification mark.



B-20

ECONOMIZER VALVE
Fig. 6

Idle Adjusting Screws

The idle adjusting screws used in the Stromberg are not interchangeable with the screws used in other carburetors. These screws can be identified by the slot extending approximately half-way across the knurled end of the screw as shown in figure 7. The idle adjusting screw for the Ford type carburetors can be identified by a slot extending across the knurled end of the screws as shown in figure 8.

B-13

STROMBERG IDLE ADJUSTING SCREW
Fig. 7

B-14

FORD IDLE ADJUSTING SCREW
Fig. 8

Main Metering Jets

The main metering jets have their size number stamped on the jets as shown in figure 9. Refer to subject 9000, page 3 for the proper jet size for the various carburetors.

B-21

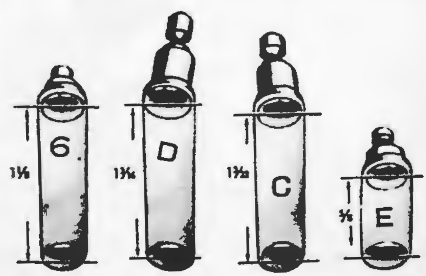
MAIN METERING JET
Fig. 9

Pump Links

The carburetor pump links are of different lengths for the various carburetors and can be identified by a mark stamped on the link (figure 10).

The correct links for the various carburetors are as follows:

Pump Link Part Number	Identification Mark	Carburetor Part Number Prefix
78-9526	6	922A
91A-9526	C	78, 91A, 21A
1GA-9526	E	1GA
26H-9526	D	86H, 06H, 16H, 26H



B-10

PUMP LINKS
Fig. 10

Symptom 9999-A

Excessive Fuel Consumption

1. FUEL CONSUMPTION DATA.

Engine	Year	Axle Ratio	Miles Per Gallon at 20 MPH	30 MPH	40 MPH	60 MPH
60 H.P.	1937-40	4.44	31.6	28.4	25.0	18.6
85 H.P.	1932-33	4.11	24.4	22.2	20.0	15.6
85 H.P.	1934	4.11	21.2	20.4	19.4	16.0
85 H.P.	1935-36	4.11	22.6	20.1	19.0	15.6
85 H.P.	1937-40	3.78	22.55	23.5	20.2	16.15
90 H.P. (V-8)	1941-42	3.78	26.0	24.3	22.4	20.0
90 H.P. (6-Cyl.)	1941-42	3.78	26.5	25.0	22.0	20.0
95 H.P.	1939-40	3.54	24.1	23.6	20.3	15.7
100 H.P.	1941-42	3.54	26.5	25.2	23.4	21.4
110 H.P.	1936-37	4.33	20.7	20.4	18.8	15.5
110 H.P.	1937	4.44	20.6	20.2	18.6	15.1
110 H.P.	1938-39	4.44	19.9	19.2	18.1	14.5
120 H.P.	1940-41	4.44	17.0	16.3	15.7	12.6
130 H.P.	1942	4.22	15.3	15.9	16.3	12.5

Some variation in fuel consumption is to be expected at higher elevations. Atmospheric conditions likewise are factors and the results will be affected by air temperature and pressure. Normal fuel consumption for passenger cars with standard axle ratios is as indicated above.

---

2. PRELIMINARY INSTRUCTIONS.

a. Preventive Maintenance.

So many factors can result in excessive fuel consumption that it usually is advisable to recommend operation MA-1-B, Preventive Maintenance, and Lubrication which will eliminate much of the following procedure, or, in most cases, will correct the trouble. If the MA-1-B operation has supposedly been performed by someone else, or if it has not corrected the trouble, proceed as follows, omitting consideration of such factors as are known to be right.

b. Brakes and Tires.

Make sure the brakes are not dragging and that the tires are inflated to the specified pressure.

c. Exhaust.

Make sure the exhaust tail pipe has not been bent or plugged with mud so as to cause restriction of the exhaust. Engines equipped with an exhaust control valve which has become inoperative and sticks in closed position will cause excessive fuel consumption and the exhaust control valve must be repaired or replaced.

d. Wheel Alinement.

Observe the type of wear on the front tires to determine if the toe-in adjustment is incorrect, and adjust the tie rod if required.

e. Spark Plug Gap.
Make sure that the spark plugs are spaced correctly.

f. Accelerating Pump.
Make sure that the accelerating pump link is in the correct position for the season.

g. Idle Engine.
Run the engine at idle speed.

h. Ignition.
Remove the wire from No. 1 spark plug and hold the wire 3/16-inch from the cylinder head and observe if the spark jumps the 3/16-inch gap regularly without missing. Make this test at each of the spark plug wires. If an unsatisfactory spark is delivered from any of the wires, follow the procedure which applies under Subject 12999.

---

3. PROCEDURE.

a. Test Fuel Consumption.
Use a mileage tester having a 1/10-gallon measure, and multiply the speedometer readings by 10 to obtain the miles per gallon. The test must be made on a straight and level road, and must be taken both with and against the wind to arrive at the average miles per gallon. If possible, have the owner along during the test. Make one test while driving the vehicle, and, if the fuel consumption is normal (par. 1 above), a second test with the owner driving.

b. Observe Owner's Driving Habits.
While the owner is driving, observe his driving habits and tactfully point out to him any practices that may account for the excessive fuel consumption. Let him see how quickly 1/10-gallon of fuel is used up during acceleration in second gear.

c. Check Ignition Timing on the Road.
If the fuel consumption is found to be higher than normal, accelerate the engine with the brakes partially applied. If a ping is not heard, it indicates the ignition timing is late. Adjust the vacuum brake on the distributor to obtain a slight ping. Check the vacuum line to the distributor for air leaks or for being clogged. If a slight ping cannot be obtained, the ignition timing must be corrected (Opr. 12000-B).

NOTE: *If the above procedure has not corrected the higher than normal fuel consumption, proceed as follows, omitting those operations that have already been performed.*

d. Clean Air Cleaner.
Clean the filter element of the air cleaner. Replace the dampening pad in the cover of the filter if it is sagged and restricting the air flow. If the vehicle is equipped with an oil bath cleaner, clean it thoroughly and refill it to the specified level with the same grade of oil as used in the engine.

e. Check Carburetor on the Vehicle.
With the air cleaner removed, make sure the choke valve opens fully each time the choke button is pushed IN. Make whatever adjustments are required. If the engine is equipped with a vacuum operated power jet or an economizer valve, run the engine at idle speed and turn the idle fuel adjusting screws completely closed. If the engine continues to run, if only for a short period, it indicates the economizer valve is leaking and must be replaced.

f. Time Ignition.
If the previous road test (subpar. c above) indicates the timing is late, remove the distributor and adjust the timing (Opr. 12000-B).

g. Clean and Space Spark Plugs and Test Engine Compression.
Clean and set the spark plug gaps at 0.025-inch. Replace any faulty plugs. Test the compression of each cylinder (Opr. 6050-A). Make the necessary repairs to valves, rings or pistons.

h. Check Fuel Pump Pressure.
Measure the fuel pump pressure with the engine running at idle speed. If the pressure is more than 3½ pounds or less than 1½ pounds, remove the fuel pump and check the fuel pump push rod stroke (tool No. 9400-A) and the rocker arm free travel (tool No. 9350-B), and make the necessary repairs or replacements.

i. Remove and Disassemble Carburetor.

Remove and disassemble the carburetor. Clean all parts, examine the float for leakage. Examine the condition of the float valve and seat. Check the size of the main metering jets. Refer to carburetor specification sheet for the correct jet sizes for the various carburetors. Make repairs as required and set the float level. On Stromberg-type carburetors examine the power jet for leakage. If it is found leaking, clean or replace the jet.

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4. ADDITIONAL POSSIBLE CAUSES.

a. If the Trouble Still Is Not Corrected.

The above procedure will correct excessive fuel consumption in nearly every case, however, several other unlikely conditions are possible, and, if the trouble still is not corrected, one of the following may be the cause:

(1) *BRAKES DRAGGING WHEN HOT.* Make sure that the brake pedal has necessary free travel and that the brake master cylinder vent is not obstructed.

(2) *HAND BRAKE DRAGGING.* Owner may not have been releasing hand brake fully.

(3) *EXCESSIVE EXHAUST BACK PRESSURE.* If it is suspected that there is excessive exhaust back pressure due to clogged muffler, sticking exhaust thermostat, clogged or bent tail pipe, etc., make the test outlined in paragraph 3 a above with the exhaust disconnected during the test.

(4) *CAMSHAFT OUT OF TIME.* Camshaft out of time if either gear has been replaced, major repairs have just been made, or if the main bearings have been replaced, the crankshaft may have been dropped low enough to get the gear out of time. Remove the gear cover to inspect.

(5) *TOO LITTLE VALVE CLEARANCE.* Too little valve clearance resulting in valves not completely closing when hot (does not apply with hydraulic lifters). Remove the valve chamber cover to inspect.

(6) *TOO MUCH VALVE CLEARANCE.* Too much valve clearance resulting in valves opening late and closing early (does not apply with hydraulic lifters). Remove valve chamber cover to inspect.

(7) *ENGINE TIGHTNESS.* Wrong size parts may have been installed. This is particularly true if piston rings have been installed without sufficient gap.

(8) *VALVES STICKING.* It is possible for the valve action to be sluggish during operation and not show up as noisy during idle.

Symptom 9999-B

Fuel Not Reaching the Carburetor

1. PRELIMINARY INSTRUCTIONS.

If the vehicle is equipped with a fuel shut-off valve, make certain it is open and that there is a sufficient supply of fuel in the tank. Make sure the fuel tank vent is open.

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2. PROCEDURE.

a. Check Fuel Line.

Remove the flexible tube from the fuel pump and replace it if it leaks air or if the passage is obstructed (some times the lining of this tube comes loose and obstructs the passage under suction also some replacement tubes are not reinforced and collapse under suction). Remove the fuel tank filler cap and blow out the fuel line.

b. Check for Water in Fuel Tank.

Remove the drain plug and drain any accumulation of water or sediment from the tank. In freezing weather, water in the fuel tank will freeze and may shut off fuel from entering the fuel line. Allow tank to reach room temperature before draining.

c. Check Fuel Pump.

Remove the fuel line between the fuel pump and the carburetor and blow through the line to make sure it is not clogged. With the ignition switch OFF crank the engine with the starter. If a free flow of fuel is not evident, it indicates the fuel pump is faulty and must be repaired or replaced. If the fuel pump and the fuel line is found satisfactory, it indicates an obstruction in the carburetor. Remove carburetor, clean and inspect the carburetor float valve mechanism.

Symptom 9999-C
Carburetor Floods

1. PRELIMINARY INSTRUCTIONS.

In addition to the engine running unevenly, a strong odor from gasoline usually is present when the carburetor is flooding. If the carburetor is flooding due merely to overchoking, open the throttle wide and crank the engine to exhaust the rich gasses in order to start the engine.

2. PROCEDURE.

a. Check Carburetor Choke Action.

Remove the air cleaner, and operate the choke rod and observe if the carburetor choke plate opens freely. If the choke action is faulty, make necessary corrections.

b. Check Fuel Pump Pressure.

Test the fuel pump pressure with the engine running at idle speed. If the pressure is found to be more than 3½ pounds or less than 1½ pounds, test the push rod stroke (tool 9400-A) and the rocker arm free play (tool 9350-B), and make the necessary repairs or replacements.

c. Remove and Disassemble Carburetor.

Remove and disassemble the carburetor. Clean all parts, examine the float for leaking and the condition of the float needle valve and seat. Make repairs as required and set the float level. Reinstall the carburetor on the engine.

Symptom 9999-D
Fuel Mixture Too Lean

1. PROCEDURE.

a. Test Fuel Tank and Lines.

Make sure the fuel pump drain plug and the cover are seated firmly and not leaking, and that the fuel tank vent is open and unrestricted. Remove the flexible line at the intake side of the fuel pump and replace it if there is any indication of leakage. Remove the fuel tank cap then blow compressed air back through the fuel line to remove any obstructions.

b. Test Fuel Pump.

Check the fuel pump pressure. If the pressure is not between 1½ pounds and 3½ pounds, remove the fuel pump and make the necessary repairs or replacements. Also check the fuel pump push rod stroke (tool 9400-B) and the rocker arm free play (tool 9350-A).

c. Clean and Adjust Carburetor.

Remove, disassemble, and clean the carburetor, making the necessary repairs. Set the float level. Set the accelerating pump link in the proper hole for the prevailing temperature. Make sure the accelerator linkage permits a full throttle opening.

d. Test Engine Vacuum.

Tighten the intake manifold screws or nuts. Connect a vacuum gage to the windshield wiper connection of the intake manifold and observe the reading as the engine idles. If the vacuum is lower than normal, it is probably due to leakage. Points at which the manifold vacuum may leak are: Any vacuum line (distributor, windshield wiper, two-speed axle shift, power brake, etc.), intake manifold gasket, or faulty intake manifold.

May 25, 1945

10000—GENERATOR

Part Number	CHARACTERISTICS: Pulley "O.D." In Inches	CHARACTERISTICS: Engine R.P.M. to Test Voltage	CHARACTERISTICS: Watts	CHARACTERISTICS: Engine R.P.M. Charge Starts	CHARACTERISTICS: Maximum Rate: Amps.	CHARACTERISTICS: Maximum Rate: Engine R.P.M.	BRUSHES: Amps. at 2500 R.P.M.	BRUSHES: Number	BRUSHES: Original Length (Inches)	BRUSHES: Wear Limit Length (Inches)	FIELD: Part Number	FIELD: Resistance: Ohms at 70° F.	FIELD: Resistance: Ohms at 140° F.	ARMATURE: Part Number	ARMATURE: Resistance: Ohms at 70° F.	ARMATURE: Resistance: Ohms at 140° F.	Generator Replaced in Service by Part Number
B-10000	3.62		75	450	12	1000	9	3	.80	.35	40-10175	1.0	1.22	46-10005			
BB-10000-D	3.68		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	18-100005	0.29	0.36	82A-10000-A
18-10000-A	4.08		189	1000	27	1300	11	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	
18-10000-H	4 08		140	530	20	1900	20	3	.80	.35	40-10175-H	1.44	1.75	18-10005-H	0.41	0.50	
40-10000-A	4 08		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	81A-10000-A
40-10000-B	4.38		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	81A-10000-A
40-10000-H	4.40		140	570	26	2050	20	3	.80	.35	40-10175-H	1.44	1.75	18-10005-H	0.41	0.50	81A-10000-B
46-10000-B	3.62		119	450	17	1100	11	3	.80	.35	40-10175	1.0	1.22	46-10005	0.29	0.36	B-10000
51-10000-A	4 08*		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	79-10000-B
67-10000-A	5.18		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	81A-10000-A
67-10000-H	5.18		182	525	26	1250	16	3	.80	.35	40-10175-H	1.44	1.75	68-10005-H	0.19	0.23	81A-10000-B
68-10000-A	4.38		140	550	20	1800	20	3	.80	.35	40-10175	1.0	1.22	18-10005	0.29	0.36	81A-10000-A
68-10000-HA	4.38		182	525	26	1250	16	3	.80	.35	68-10175-H	1.44	1.75	68-10005-H	0.19	0.23	81A-10000-B
68-10000-HB	4.38		126	350	18	1000	16	3	.80	.35	68-10175-H	1.44	1.75	18-10005	0.29	0.36	81A-10000-C
74-10000-HA	3.68		126	350	18	950	16	3	.80	.35	68-10175-H	1.44	1.75	74-10005-HA	0.19	0.32	82A-10000-C
74-10000-HB	3.68		182	500	26	1200	16	3	.80	.35	68-10175-H	1.44	1.75	74-10005-HB	0.29	0.36	82A-10000-B
78-10000-A	4.38		196	525	28	1250	28	3	.80	.35	78-10175	2.7	3.3	78-10005-A	0.19	0.23	81A-10000-D
78-10000-B	4.38		140	350	20	1000	20	3	.80	.35	78-10175	2.7	3.3	78-10005-B	0.29	0.36	81A-10000-E
78-10000-HA	4.38		182	525	26	1250	16	3	.80	.35	68-10175-H	1.44	1.75	78-10005-HA	0.19	0.23	81A-10000-B
78-10000-HB	3.68		182	350	26	1000	16	3	.80	.35	68-10175-H	1.44	1.75	78-10005-HA	0.19	0.23	82A-10000-B
78-10000-HC	4.38		126	350	18	1000	16	3	.80	.35	68-10175-H	1.44	1.75	78-10005-HB	0.29	0.36	81A-10000-E
79-10000-B	4.68*		119	500	17	1350	11	3	.80	.35	40-10175	1.0	1.22	79-10005-A	0.29	0.36	
79-10000-HA	4.68*		182	525	26	1300	16	3	.80	.35	78-10175-H	1.44	1.75	79-10005-HA	0.19	0.23	81T-10000-A
79-10000-HB	4.68*		126	525	18	850	16	3	.80	.35	78-10175-H	1.44	1.75	79-10005-HB	0.29	0.36	81T-10000-B
81A-10000-A	4.38		119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	79-10005-A	0.29	0.36	
81A-10000-B	4.38		182	525	26	1250	16	3	.80	.35	78-10175-H	1.44	1.75	79-10005-HA	0.19	0.23	
81A-10000-C	4.38		126	350	18	1000	16	3	.80	.35	78-10175-H	1.44	1.75	79-10005-HB	0.29	0.36	81A-10000-E
81A-10000-D	4.38	1875	196	500	28	1250	28	2	.80	.35	78-10175	2.7	3.3	78-10005-A	0.18	0.20	
81A-10000-E	4.38	1875	140	350	20	1000	20	2	.80	.35	78-10175	2.7	3.3	78-10005-B	0.29	0.36	
81T-10000-A	4.68*	1600	196	550	28	1300	28	2	.80	.35	78-10175	2.7	3.3	78-10005-A	0.18	0.20	7RA-10000-C
81T-10000-B	4.68*	1600	140	350	20	1050	20	2	.80	.35	78-10175	2.7	3.3	78-10005-B	0.29	0.36	7RA-10000-C
82A-10000-A	3.71	1600	119	500	17	1300	11	3	.80	.35	40-10175	1.0	1.22	79-10005-A	0.29	0.36	
82A-10000-B	3.71		182	525	26	1250	16	3	.80	.35	78-10175-H	1.44	1.75	82A-10005-A	0.19	0.23	82A-10000-D
82A-10000-C	3.71		126	350	18	1000	16	3	.80	.35	78-10175-H	1.44	1.75	82A-10005-B	0.29	0.36	82A-10000-E
82A-10000-D	3.68	1575	196	500	28	1250	28	2	.80	.35	78-10175	2.7	3.3	78-10005-A	0.18	0.20	7RA-10000-C
82A-10000-E	3.68	1575	140	350	20	1000	20	2	.80	.35	78-10175	2.7	3.3	78-10005-B	0.29	0.36	7RA-10000-C
91A-10000	3.68	1575	196	500	28	1250	28	2	.86	.35	78-10175	2.7	3.3	78-10005-A	0.18	0.20	7RA-10000-C
99B-10000	4.68†	2025	500	720	55	1150	55	4	1.10	.55	99B-10175	5.44	6.4	99B-10005	0.06	0.08	99B-10000-C
01A-10000	3.68	1575	222	580	32	1100	32	2	.86	.40	01A-10175	2.1	2.5	01A-10005	0.16	0.18	7RA-10000-C
01AS-10000-A	4.26	1850	300	390	45	604	45	4	1.10	.55	01AS-10175	4.0	4.65	99B-10005	0.06	0.08	21AS-10000-D
01AS-10000-B	3.68	1575	300	339	45	517	45	4	.86	.40	01AS-10175	4.0	4.65	99B-10005	0.06	0.08	21AS-10000-D
01TS-10000	4.26‡	1850	500	660	55	1050	55	4	1.10	.55	99B-10175	5.44	6.4	99B-10005	0.06	0.08	
01A-10000-B	3.18	1375	220	520	30	1060	30	2	.86	.40	81A-10175	2.88	3.34	01A-10005	0.16	0.18	7RA-10000-C
01AS-10000-H	3.68	1575	300	390	50	604	50	4	1.10	.55	01AS-10175	4.00	4.65	99B-10005	0.06	0.08	21AS-10000
01W-10000	4.68*	2025	220	780	30	1500	30	2	.86	.40	81A-10175	2.88	3.34	78-10005-A or B	0.18	0.20	7RA-10000-C
01AS-10000-D	2.78	1225	220	450	30	900	30	2	.86	.40	81A-10175	2.88	3.34	01A-10005	0.16	0.18	01AS-10000-D
01AS-10000-E	4.00	1725	130	400	25	800	25	2			Bosch			Bosch			21AS-10000
01AS-10000-F	3.00	1300	130	300	25	600	25	2			Bosch			Bosch			21AS-10000
9N-10000-C	3.18	1375	119	385	11.5	925	11.5	3	.80	.35	40-10175	1.00	1.22	18-10005	0.29	0.36	8N-10000
1NC-10000	3.68	1575	220	610	30	1240	30	2	.86	.40	81A-10175	2.88	3.34	01A-10005	0.16	0.18	7RA-10000-C
1G-10000-B	3.80*	1650	220	565	30	1160	30	2	.86	.40	81A-10175	2.88	3.34	1G-10005	0.16	0.18	7RA-10000-C
2GA-10000-A	3.80*	1650	220	565	30	1160	30	2	.86	.40	81A-10175	2.88	3.34	2GA-10005	0.16	0.18	7RA-10000-C
2GAS-10000-A	3.80*	1650	300	339	50	517	50	2	1.10	.55	01AS-10175	4.00	4.65	99B-10005	0.06	0.08	
2GAS-10000-B	3.80*	1650	220	405	30	915	30	2	.86	.40	2GAS-10175	4.00	4.63	2GAS-10005	0.10	0.12	
2GTS-10000	3.80*‡		500	339	50	517	50	2	1.10	.55	99B-10175	6.32	7.32	99B-10005	0.06	0.08	
21A-10000	3.18	1375	220	520	30	1060	30	2	.86	.40	81A-10175	2.88	3.34	01A-10005	0.16	0.18	7RA-10000-C
21TS-10000	3.68‡	1575	500	468	55	615	55	4	1.10	.55	19B-10175	5.07	5.88	19B-10005	0.06	0.08	
21AS-10000-A	3.68	1575	300	335	50	575	50	4	1.10	.55	2GAS-10175	4.00	4.63	99B-10005	0.06	0.08	21AS-10000-D
21AS-10000-B	3.18	1375	220	395	30	885	30	2	.86	.40	2GAS-10175-B	4.00	4.63	2GAS-10005	0.10	0.12	
19B-10000	4.68†‡	2025	500	560	55	800	55	4	1.10	.55	19B-10175	5.07	5.88	19B-10005	0.06	0.08	
2NCS-10000	3.68	1575	240	520	40	1060	40	2	.86	.40	81A-10175	4.00	4.65	2GAS-10005	0.10	0.12	
7RA-10000-C	4.25	1500	220	630	30	1650	30	2	.85	.40	81A-10175	4.00	4.65	01A-10005-A1	0.10	0.12	
8EH-10000-B	4.25	1500	285	405	42	1345	42	2	.86	.40	8EH-10175	4.00	4.65	7RA-10005-A	0.10	0.12	
7HA-10000-B	.425	1500	220	620	30	1650	30	2	.86	.40	81A-10175	4.00	4.65	01A-10005-A1	0.10	0.12	
8N-10000	3.18	1375	119	385	11.5	975	11.5	3	.80	.35	8N-10175	3.6	4.2	18-10005-C	0.29	0.36	

*Double †Triple ‡12 Volt

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10505—CUTOUTS AND REGULATORS

Part Numbers	Type	Cut in Voltage		Voltage Regulation at 70° F.		Amperage Regulation at 70° F.		Regulator Replaced in Service by Part Number
		Min.	Max.	Min.	Max.	Min.	Max.	
B-10505	Cutout only	6.1	6.3	—	—	—	—	
01A-10505	Standard	6.1	6.3	7.0	7.2	30	33	59A-10505-C
68-10505*	Two rate relay	6.1	6.3	8.0	8.3	*	*	
11AS-10505-A	Police	6.1	6.3	7.3	7.5	39	42	11AS-10505-E
11AS-10505-B	Special for F.B.I.	6.1	6.3	7.0	7.3	30	33	11AS-10505-F
11AS-10505-C	For Tropics	6.1	6.3	6.8	7.0	22	25	
19B-10505	Bus	12.5	13.0	14.0	14.4	50	52	
11AS-10505-E	Police	6.1	6.3	7.0	7.3	39	42	59AS-10505
11AS-10505-F	Special for F.B.I.	6.1	6.3	7.0	7.3	30	33	59AS-10505
11AS-10505-G	For Tropics	6.1	6.3	6.8	7.0	22	25	59AS-10505
59A-10505	Standard	6.1	6.3	7.0	7.3	30	33	
59AS-10505	Special	6.1	6.3	7.0	7.3	39	42	
5EH-10505	Standard	6.1	6.3	7.0	7.3	39	42	
8N-10505	Two Unit Vibrator Type	6.1	6.5	7.0	7.3			

*Reduces charging rate when voltage becomes excessive (3 brush generator only).

10655—BATTERIES

Part Number	Volts	Plates	Amp. Hours
B-10655-B	6	15	
18-10655	6	13	
SE51-10655	12		
81A-10655-A	6	17	
81A-10655-B	6	15	

Part Number	Volts	Plates	Amp. Hours
86H-10655-A	6		
06H-10655-A	6		
01A-10655-A	6	17	120
01A-10655-C	6		100
19B-10655	12		

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Operation 10505-A

Test 2-Brush Generator Regulator on Vehicle

The following test procedure applies to all 3-unit generator regulators, with the exception of the 59AS (police regulator). Information on the 59AS regulator is given subject 10505, page 19.

The generator regulator assembly test can be made on the vehicle with either the Ford Laboratory Test Set and a ¾-ohm resistor or the Ford Diagnosis Test Set. If other equipment or if separate meters are used, the voltmeter must have a range from 0 to 10 volts calibrated in tenths and be accurate within $\frac{1}{10}$ volt, and the ammeter should have a range from 0 to at least 50 amperes (with a "O" center scale) and be accurate within ½ ampere.

Drawings showing the various methods used to test regulator setting with the new Ford Diagnosis Test Set are shown in figs. 2, 3 and 4.

NOTE: *All limits and specifications have been omitted from these procedures. See Subject 10000 for specifications.*

1. PRELIMINARY.

Before coming to the conclusion that the generator regulator is faulty or out of adjustment, it is advisable to make a thorough check of the complete generating circuit. This will definitely locate the unit which is at fault. If it is definitely determined that the regulator is faulty and requires repair, see operations 10505-B or C.

NOTE: *Before checking the generating circuit, make sure the generator belt is properly adjusted. The numbers appearing in the text are to establish locations in the circuit (fig. 1).*

a. Recharge or Replace Battery.

Recharge the battery if its specific gravity is below 1.250. Replace the battery if a high discharge test after charge indicates it is worn out or under capacity.

b. Check Generator to Battery Circuit Resistance.

Connect the voltmeter negative lead to the armature terminal ① of the generator. Remove the wire at the "B" terminal of the regulator and connect an ammeter in series at this point. Start the engine and set the speed to a point where the amperage is more than 5 amperes.

(1) Connect the positive voltmeter lead to the ARM terminal ⑤ of the regulator. Observe the reading on the voltmeter.

(2) Contact the voltmeter positive lead to the BAT terminal ⑥ of the regulator. If the reading is more than 6 times the reading obtained in subpar. (1) above, loose or faulty connections exist that must be corrected, or excessive resistance exists in the cutout points, and the points must be adjusted or replaced. See operation 10505-C.

(3) Contact the voltmeter lead to the negative battery post ⑩. If the reading is more than 6½ times the original reading (subpar. (1) above), clean and tighten all terminals from the generator terminals to the battery terminal ① through ⑬.

c. Check Ground Circuit Resistance.

With the generator charging at least 20 amperes, connect the voltmeter positive lead to the battery positive post ⑬ and the voltmeter negative lead to the generator frame. If the reading exceeds 0.1 volt, clean and tighten the ground straps and generator bracket.

d. Check Generator Output.

Connect a jumper wire from the armature terminal ① to the field terminal ② of the generator. Disconnect the ARM wire at the regulator ⑤. Run the engine approximately 1500 R.P.M. Connect the ammeter negative lead to the armature terminal of generator ① and the positive lead to the negative post ⑩. Turn the headlights on.

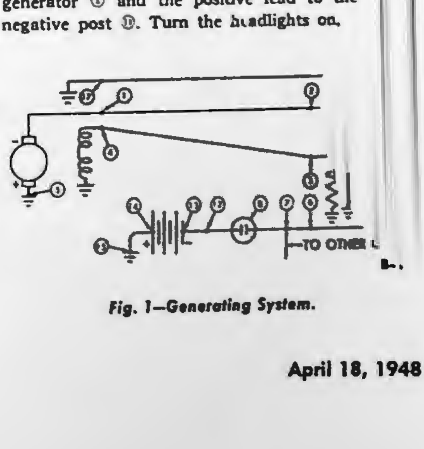

Fig. 1—Generating System.

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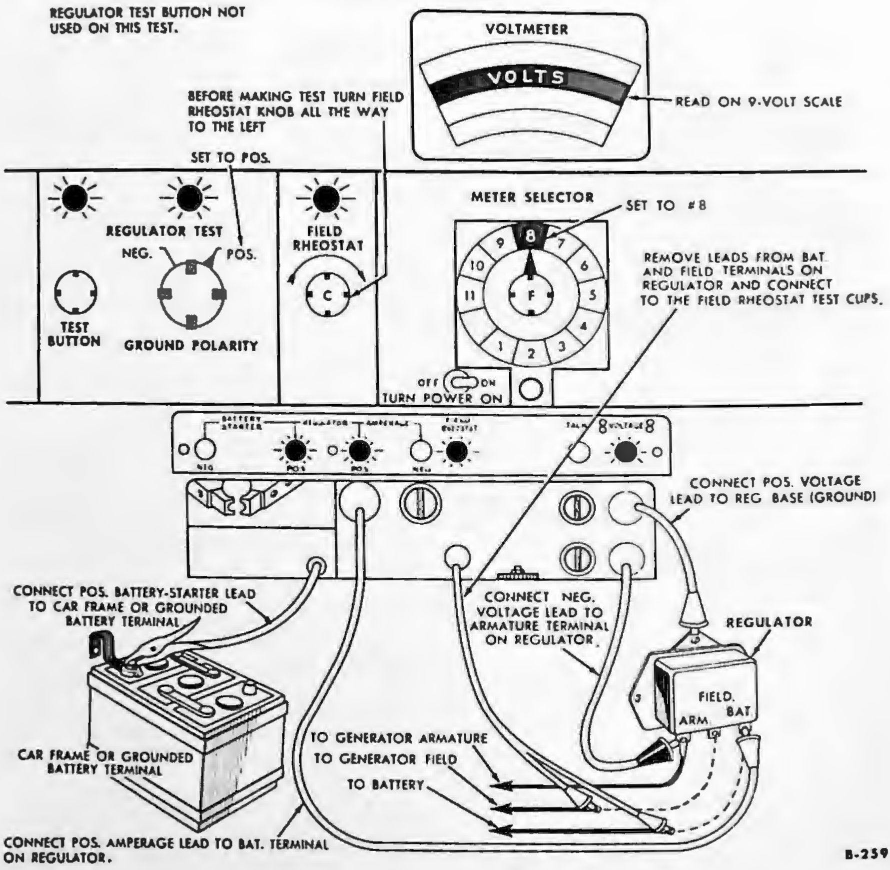

Fig. 2—Checking Cut-in Voltage, Using Diagnosis Test Set.

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the starter button, or use load provided in Test Set. Observe the ammeter. If the amperage is less than the limit specified, repair or replace the generator.

NOTE: *The Ammeter should be disconnected before the engine is stopped. Stop the engine immediately after the test is completed to to prevent overheating the generator. Do not disconnect the jumper wire at the generator until the engine has been stopped or is idling.*

e. Check Regulator Setting.

NOTE: *The Engine must be at normal operating temperature before checking regulator setting.*

Connect the voltmeter negative lead to the generator armature terminal ① and the positive lead to ground. Remove the wire from the BAT terminal ⑥ at the regulator. Install a ¾-ohm resistor on the BAT terminal of the regulator, and clip the wire on the ¾-ohm resistor to a good ground.

NOTE: *Use care not to short the battery terminal to the regulator case when disconnecting the battery wire. Arcing at this point can be avoided by temporarily disconnecting the battery ground strap.*

(1) *CHECK CUT-IN VOLTAGE.* Start the engine. Slowly and steadily increase the engine speed, at the same time observe the voltage at which the cut-out closes. This will be indicated by a sudden drop of the voltmeter pointer.

The last reading obtained just before the reading drops will be the cut-in voltage of the cut-out.

NOTE: *In some cases it will be found that the idling speed of the engine will be above the speed at which the cut-out cuts in. In these cases it will be necessary to slow the idling speed for the test. If Diagnosis Test Set is used, the field rheostat can be used to lower the generator voltage.*

If the cut-in voltage is not within the limits specified, adjust and/or replace the cut-out points.

(2) *CHECK VOLTAGE REGULATION.* Disconnect the ¾-ohm resistor, and connect the ammeter negative lead to the "B" terminal of the regulator and the positive lead to the wire which was removed from the regulator. Turn the headlights on (and other electrical accessories if necessary) until the ammeter reads approximately 10 amperes. Increase the engine speed to approximately 1500 R.P.M. Observe the reading on the voltmeter. If the reading is not within the specified limits, adjust the voltage regulation.

(3) *CHECK CURRENT LIMITER.* With the meters still connected as in the previous test and the headlight switch on, increase the engine speed to 1500 R.P.M. Press the starter button for additional battery load or use the load provided in the test set. Observe the ammeter reading. If the reading is not within the limit specified, adjust the current regulation.

NOTE: *If the vehicle is used for door-to-door delivery, or if the vehicle is frequently parked over a period of time (such as chauffeur-driven cars) with the engine running, proceed as follows to check reverse current required to open cut-out:*

Reduce the engine speed until the amperage reading drops to approximately 5 amperes. As the engine speed is reduced further, a negative reading will be obtained at least momentarily until the cut-out points open. This negative reading is reverse current, and should not exceed 8 amperes.

Remove the meters and connect the wire to the BAT terminal of the regulator.

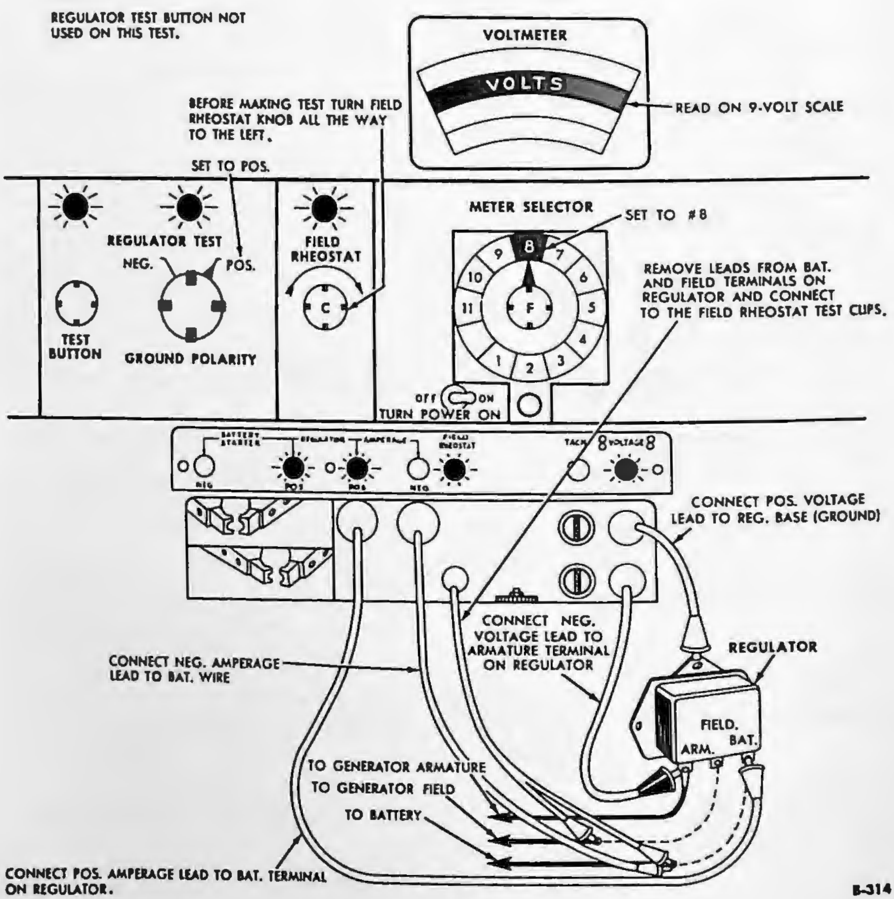

Fig. 3—Checking Cut-out Opening (Reverse Current), Using Diagnosis Test Set.

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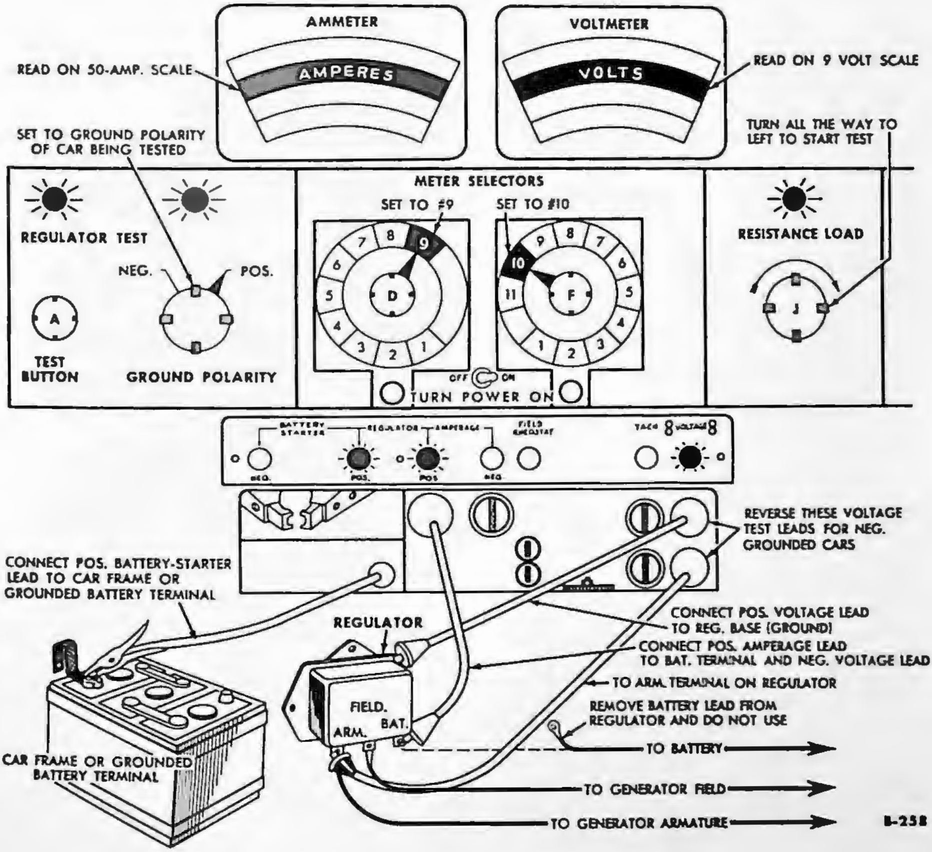

Fig. 4—Checking Current and Voltage Regulation, Using Diagnosis Test Set.

Operation 10505-B

Regulator Contact Replacement

Several design changes have been made in the generator regulator. These changes are described in pars. a and b below. If the generator regulator is one of the old types, it is imperative when servicing the generator regulator to incorporate these changes.

a. Current Limiter.

When servicing the current limiter, replace the armature with the latest design, 01A-10551-A (fig. 5). This latest design armature, which is used on the current limiter only, has a silver contact.

When using this armature, it is necessary to use the latest type contact screw, 01A-10653-A (fig. 5). The old type contact screw, which is 0.33 inch long, should not be used.

When assembling the current limiter, use an additional spacer (01A-10568-A) between the armature and frame (fig. 6). These spacers must be used with the latest type armature.

b. Voltage Control.

When servicing the voltage regulator, replace the armature with the latest design (01A-10551-B) (fig. 7). This latest design armature is used on the voltage regulation unit only. This armature differs from the armature used on the current limiter in that the contact is made of tungsten, and also is provided with a brass rivet to prevent the armature from actually contacting the core.

When using the latest type armature, use contact screw 01A-10653-B1 or 01A-10653-B2 (fig. 7). These contact screws are optional and are to be used with 01A-10551-B armature on the voltage regulator only. These contacts are made of platinum.

When servicing the voltage regulator with a box-type shunt, replace the original spacer used between the armature and core with the 01A-10568-B spacer (fig. 8). If servicing the old type voltage regulator, use an additional spacer (01A-10568-B) between the armature and frame.

c. Regulator Contact Replacement.

NOTE: *The following procedure applies to either the voltage or current control.*

(1) *DISASSEMBLE.* Remove the cover from the regulator. Remove the two screws securing the regulator armature to the frame (fig. 10). Remove the cleat, regulator armature, and spacer. Loosen the lock nut and remove the contact screw.

(2) *ASSEMBLE.* Assemble new regulator contacts, making the necessary changes as described in par. a or b above. Be sure the contacts are properly lined up before tightening the two screws securing the armature to the frame.

(3) *SET AIR GAP.* Bend the adjusting arm down until the armature spring is clear of the adjusting arm. Place a piece of round stock 0.035 inch in diameter between the armature and core, as shown in fig. 11.

With the gauge between the armature and core, press down on the regulator armature with a pencil.

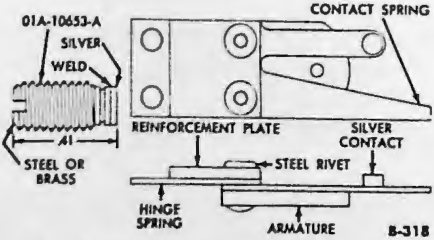

Fig. 5—Latest Design Current Limiter Armature (01A-10551-A) and Contact Screw (01A-10653-A).

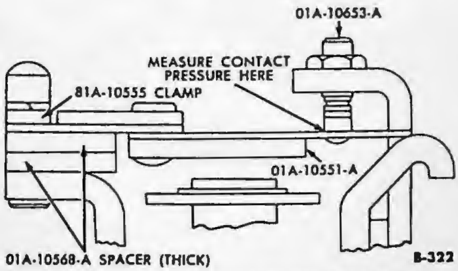

Fig. 6—Latest Type Current Limiter and Contact Screw Properly Installed.

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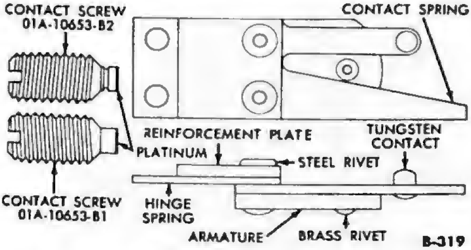

Fig. 7—Latest Type Voltage Regulator Armature (01A-10551-B) and Contact Screws (01A-10653-B1 and 01A-10653-B2).

Lower the upper contact until it just touches the lower contact, and tighten the lock nut.

NOTE: *The armature on the voltage control is provided with a brass rivet to prevent the armature from actually contacting the core. When setting the air gap, be sure the gauge is not under the brass rivet.*

(4) *ALIGN CONTACTS.* After setting the air gap, again check the alignment of the contacts. Note the angle at which the contacts break. If the contacts are not breaking or contacting squarely, bend or twist the arm supporting the upper contact either up or down or sidewise as required, and again check the contact.

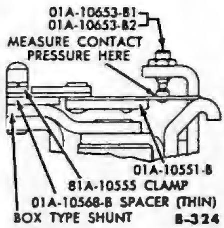

Fig. 8—Voltage Regulator (Box Type Shunt).

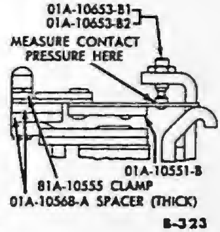

Fig. 9—Voltage Regulator (Old Type).

(5) *CHECK PRESSURE OF VOLTAGE OR CURRENT CONTACTS.* Using an accurate pressure scale, check the pressure on the contacts as shown in fig. 12. The minimum pressure at the contacts just as they break must not be less than 5 ounces for either the voltage control or current limiter contacts. If the pressure is less than specified, adjust the upper contact screw until the proper pressure is obtained. Tighten the lock nut after the adjustment is made.

(6) *ADJUST.* Adjust the regulator setting to the specified limits (Opr. 10505-D).

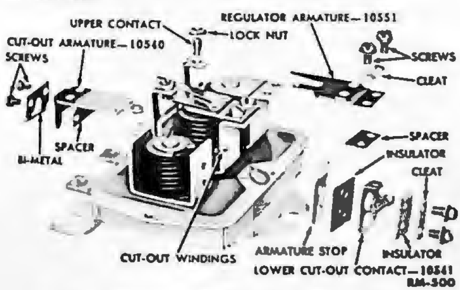

Fig. 10—Generator Regulator, Disassembled.

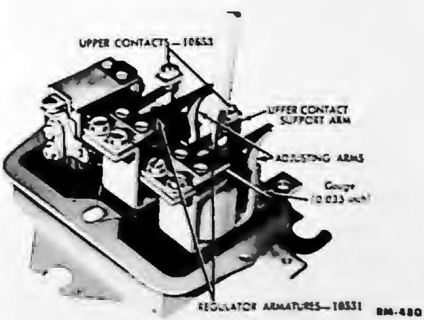

Fig. 11—Setting Regulator Air Gap.

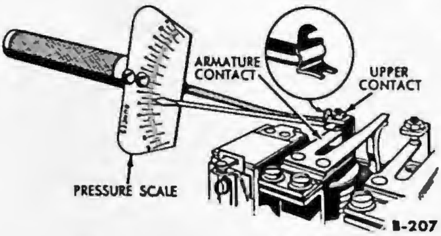

Fig. 12—Checking Contact Pressure.

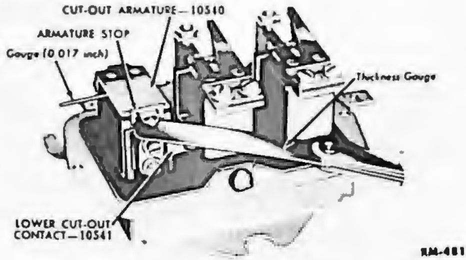

Fig. 13—Setting Air Gap on Cut-out Contacts.

Operation 10505-C

Cut-Out Contact Replacement

NOTE: *Lower cut-out contacts (10541) are replaceable only on "F" type regulators. If the lower cut-out contacts in the "B" type regulator are damaged, the regulator assembly must be replaced.*

a. Disassemble. Remove the two screws securing the bimetal, cut-out armature (10540) and spacer to the frame (fig. 10). Remove the cut-out armature, bimetal, and spacer from the frame. Soften the solder securing both cut-out winding wires to the lower contact (10541) with a soldering iron. Remove the two screws securing the lower contact to the frame. Remove the cleat, insulators, lower contact, and armature stop.

b. Assemble. Place the lower contact (10541) with the armature stop, insulators, and cleat in position on the frame in the order shown in fig. 10. Secure the lower contact in place with the two screws. Do not tighten the screws at this time. Solder the cut-out winding wires to the lower contact. Place the armature cut-out (10540) with the spacer under the armature hinge and the bimetal on top of the hinge in the order shown in fig. 10.

(1) *SET AIR GAP AND CONTACT SPACING.* Place a 0.017 inch thickness gauge (or round stock) between the armature and core (fig. 13). Lower the armature stop until it is resting on top of the armature (10540) and at the same time raise the lower contact until the point gap is 0.010 inch. Tighten the two screws securing the lower contact after this adjustment is made.

(2) *ALIGN CONTACTS.* After the air gap and point spacing have been established, again check the alignment of the contacts. Note the angle at which the contacts break. If the contacts are not breaking or contacting squarely, bend the lower cut-out contacts (10541) either up or down and again check the alignment.

NOTE: *If the lower contact was bent to obtain alignment, it will be necessary to recheck and, if necessary, reset the air gap and respace the contacts.*

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Operation 10505-D

Generator Regulator Adjustment

a. Adjust Cut-in Voltage.

NOTE: *Test cut-in voltage as outlined in Operation 10505-A. Adjust the cut-in voltage if it is not within the specified limits.*

Remove the cover from the regulator. If the setting is lower than specified, increase the spring tension by bending the bimetal downward (fig. 14). To decrease the setting, bend the bimetal upward.

b. Adjust Voltage Regulator.

NOTE: *Test voltage regulation as outlined in Operation 10505-A. Adjust the voltage regulation if it is not within the specified limits.*

Remove the cover from the regulator. If the voltage is less than specified, increase the adjusting arm tension by bending the adjusting arm upward (fig. 15). To decrease the voltage, bend the adjusting arm downward. Repeat the test with the cover temporarily in place, and readjust if necessary.

c. Adjust Current Regulation.

NOTE: *Test current regulation as outlined in Operation 10505-A. Adjust the current regulation if it is not within the specified limits.*

Remove the cover from the regulator. If the current regulation is low, increase the tension on the adjusting arm by bending the arm upward (fig. 16). To decrease the current, bend the arm downward.

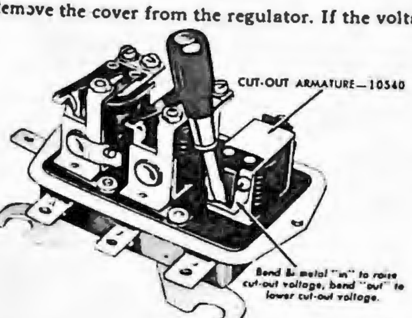

Fig. 14—Adjusting Cut-in Voltage.

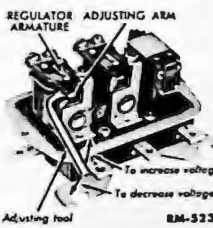

Fig. 15—Adjusting Voltage Regulation.

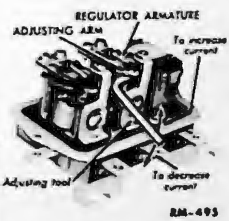

Fig. 16—Adjusting Current Regulation.

DIAGNOSE—
DON'T
GUESS

April 18, 1948

Electric Temperature Gauge

All cars and trucks use an electric-type water temperature gauge to indicate to the driver the temperature of the water in the cooling system of the car. These gauges use the same basic idea of operation as the oil pressure and fuel level gauges used for some time. These are fully explained under Subject Nos. 9270 and 9273.

One notable difference, however, exists in that with the water temperature gauge dash unit, the smaller the current the higher the reading. These were designed this way due to the fact that most of the time the car is operated under normal temperatures, and, of course, the smaller current consumption is desirable.

When the current is turned off (ignition switch off), the bimetal is straight as in fig. 2 below, and the reading is to the right at "H." This does not mean that the water temperature in the cooling system is at 212 degrees but merely that the gauge is turned off, and that a reading of "H" is the normal reading when the gauge is off.

When the ignition switch is turned on, the temperature indicator likewise is turned on, and the current passes through both the dash unit and the engine unit. All 8-cylinder engines now use two engine units, one in each cylinder head.

The engine sending unit normally is grounded, however, as the current passes through the engine unit to ground, heat is generated in the engine unit coil which causes the bimetal to bend, breaking the ground contact.

This, of course, stops the flow of current which, in turn, permits the bimetal to cool and return to its original position and ground contact is again established, and the cycle is again repeated.

The same amount of current passes through both the engine and the dash units, since they are connected in series with each other. This current causes the bimetal in the dash unit also to heat, causing the pointer to be pulled over to the left, as shown in fig. 1 below.

When the engine is started and is permitted to run, the temperature of the water increases. The water passing around the engine unit warms it, and the heat from the water supplements the heat generated by the current passing through the engine unit coil, thus reducing the amount of current necessary to make the bimetal draw away from the ground contact.

With less current flowing through the engine unit, less current likewise flows through the dash unit.

With less current flowing through the dash unit, the deflection or bending of the bimetal in the dash unit is less, the instrument pointer is not pulled as far to the left, and the temperature indicated by the dash unit is higher than originally indicated when the switch was first turned on.

At each increase of temperature of the cooling system water, less current is required to draw the engine unit bimetal away from its ground, and likewise less current flows through the dash unit. This results in less deflection of the dash unit bimetal and higher readings.

Fig. 1 is a schematic drawing showing both the engine and the instrument board units and the maximum bending of the bimetal in the instrument board units as would be true with low temperatures at the engine unit.

Fig. 2 is a schematic drawing showing both units and the minimum bending of the bimetal in the dash unit as would be true with the cooling system water at the boiling point or with the current turned off.

Fig. 3 is a schematic drawing showing the LEFT and RIGHT engine units used on 8-cylinder engines.

In the dual system, the left engine excessive heat unit contacts are normally closed but open when the engine coolant approaches the boiling point. With the ignition switch ON, the current passes through the dash unit, the LEFT engine unit and the RIGHT engine unit. The RIGHT sending unit is normally grounded, however, as the current passes through this unit to the ground, heat is generated in the unit coil which causes the bimetal to bend, breaking the ground contact. This stops the flow of current which

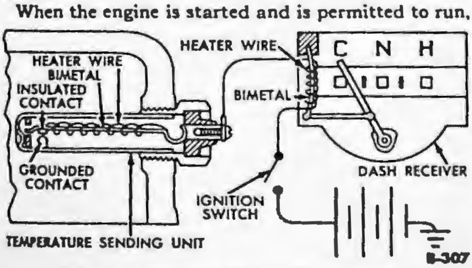

Fig. 1—Operation With Low Temperature

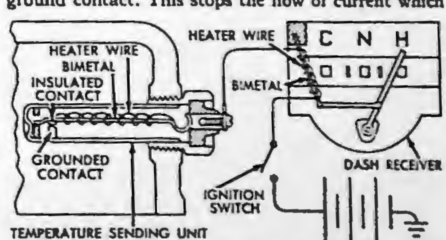

Fig. 2—Operation With High Temperature

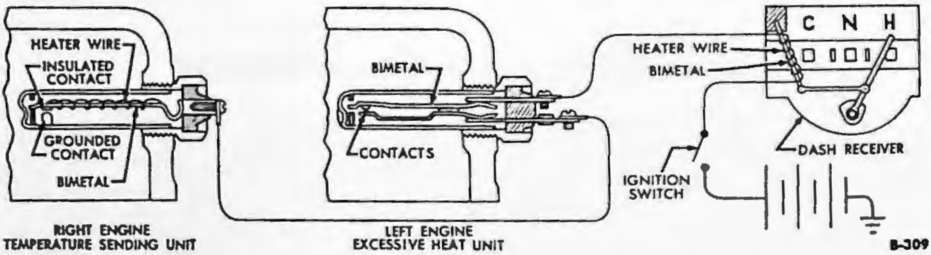

Fig. 3—Dual System Left and Right Engine Units

permits the bimetal to cool and return to its original position, and ground contact is again established and the cycle is again repeated. If, for any reason, the coolant reaches the boiling point, the temperature of the coolant causes the bimetal in the LEFT unit to bend, opening the contact which interrupts the flow of current through both the LEFT and the RIGHT units. The operation of the dash unit and the RIGHT engine unit in the dual engine unit system is as described above and shown in figs. 1 and 2.

Complete testing and trouble shooting procedure is given in the "Lights, Horn, and Instruments" section of these bulletins, Subject No. 14999, Page No. 79, Symptom No. 14999-Z.

March 18, 1948

Symptom 10999-A

Battery Low in Charge

Schematic drawings of the generating circuits are shown in the various figs. The numbers appearing in these drawings are to establish locations in the circuit.

EXAMPLE: *In the following instructions and in the drawings, ① refers to the armature terminal of the generator.*

NOTE: *With this symptom, it may be possible the current used is greater than the capacity of the generator due to:*

Excessive night driving or use of accessories.

Accidental discharge of the battery, such as lights left on over night, etc.

Excessive current used in starting as would be true with a tight engine, heavy oil, need of adjustment of spark plugs, distributor contacts, etc.

1. PROCEDURE

NOTE: *Throughout this procedure where the words "rated amperage" are used, the following values are to be used:*

5EH generator	*39 to 42 amps.*
All other 2-brush generators	*30 to 33 amps.*

Adjust or replace the fan belt if required.

a. Recharge or Replace the Battery.

Recharge the battery if its specific gravity is below 1.250. Replace the battery if a high discharge test after charge indicates it is worn out or under capacity.

b. Check Generator Output.

Disconnect the regulator battery wire ⑥, and connect an ammeter in series at this point (positive to BAT terminal of regulator).

NOTE: *Use care not to short the BAT terminal ⑥ to the regulator case when disconnecting the battery wire. Arcing at this point can be avoided by temporarily disconnecting the battery ground strap.*

Start the engine and run it at approximately 1500 revolutions per minute. Observe the ammeter and follow whichever of the following (1) or (2) that applies:

(1) *MORE THAN RATED AMPERES.* If the ammeter shows more than the rated amperes, the generator is satisfactory and the cut-out is closing. The trouble, if any, is in the regulator, follow procedure in Symptom 10999-E.

(2) *LESS THAN RATED AMPERES. If the* ammeter shows less than the rated amperes, turn the headlights on, and press the starter button to establish an electrical load, and follow whichever of the following *(a)* or *(b)* that applies:

(a) MORE THAN RATED AMPERES. If the ammeter now shows the rated amperes, the generator is satisfactory and the cut-out is closing. Proceed with paragraph c below.

(b) LESS THAN RATED AMPERES. If the ammeter still shows less than the rated amperes (engine speed 1500 revolutions per minute, starter and lights on), disconnect the ammeter lead from the BAT terminal of the regulator and connect it to the ARM terminal ③ of the regulator, and follow whichever of the following *(1)* or *(2)* that applies:

(1) MORE THAN RATED AMPERES. If the ammeter now shows more than the rated amperes, the cut-out points are either failing to close or are high resistant. Follow procedure in Symptom 10999-E.

(2) LESS THAN RATED AMPERES. If the ammeter still shows less than the rated amperes, connect a jumper wire from the ARM ① to the FIELD ④ terminals of the generator. Follow whichever of the following *a* or *b* that applies:

a. More Than Rated Amperes. If the ammeter now shows the rated amperes, the voltage regulation or current limiter setting is too low. Follow procedure in Symptom 10999-E.

b. Less Than Rated Amperes. If the ammeter still shows less than the rated amperes, the trouble exists in the generator. Follow procedure in Symptom 10999-C.

c. Check Generator to Battery Circuit Resistance.

Connect the voltmeter negative lead to the armature terminal ① of the generator. Start the engine and set the speed to a point where the amperage is more than 5 amperes.

(1) Contact the positive voltmeter lead to the ARM terminal ② of the regulator. Observe the reading on the voltmeter.

(2) Contact the voltmeter positive lead to the BAT terminal ⑥ of the regulator. If the reading is more than 6 times the reading obtained in paragraph (1) above, excessive resistance exists in the cut-out points, and the points must be adjusted or replaced.

(3) Contact the voltmeter lead to the negative battery post ⑪. If the reading is more than 6½ times the original reading (par. (1) above), clean and tighten all terminals from the generator terminals to the battery terminal ① through ⑨.

d. Check Ground Circuit Resistance.

With the generator charging at least 5 amperes, connect the voltmeter positive lead to the battery positive post ⑬ and the voltmeter negative lead to the generator frame. If the reading exceeds 0.1 volt, clean and tighten the ground straps and generator bracket.

Symptom 10999-B

Low Charging Rate (Battery Low in Charge)

Schematic drawings of the generating circuits are shown in the various figs. The numbers appearing in these drawings are to establish locations in the circuits.

EXAMPLE: *In the following instructions and in the drawings, ⑪ refers to the battery negative post.*

NOTE: *Before checking the generating circuit, make sure that the generator belt is properly adjusted.*

1. PROCEDURE

NOTE: *Throughout this procedure where the words "rated amperage" are used, the following values are to be used.*

5EH generator . . . . 39 to 42 amps.
All other 2-brush generators . 30 to 33 amps.

a. Check Generator to Battery Circuit Resistance.

Connect the voltmeter negative lead to the armature terminal ① of the generator. Start the engine, and set the speed to a point where the amperage is more than 5 amperes.

(1) Contact the positive voltmeter lead to the ARM terminal ③ of the regulator. Observe the reading on the voltmeter.

(2) Contact the voltmeter positive lead to the BAT terminal ⑥ of the regulator. The reading now should not be more than 6 times the reading obtained in paragraph (1) above. If the reading is more than this, excessive resistance exists in the cut-out points. The cut-out points must be adjusted or replaced.

(3) Contact the voltmeter positive lead to the negative battery post ⑪. The reading now should not be more than 6½ times the reading obtained in paragraph (1) above.

If the circuit resistance is more than this, clean and tighten all terminals from the generator terminals to the battery terminal ① through ⑬.

b. Check Ground Circuit Resistance.

With the generator charging at least five amperes, connect the positive voltmeter lead to the battery positive post ⑬ and the voltmeter negative lead to the generator frame. If the reading exceeds 0.1 volt, clean and tighten the ground strap and generator bracket.

c. Check Generator.

Connect a jumper wire from the armature terminal ① to the field terminal ④ on the generator. Remove the wire from the ARM terminal ③ at the regulator and connect an ammeter in series at this point. Start the engine and run it at approximately 1500 revolutions per minute. Observe the ammeter and follow whichever of the following (1) or (2) that applies:

(1) *MORE THAN RATED AMPERES.* If the ammeter shows the rated amperes or more, the generator is satisfactory, proceed with Symptom 10999-E.

(2) *LESS THAN RATED AMPERES.* If the ammeter shows less than the rated amperes, the generator is at fault, follow the procedure in Symptom 10999-C.

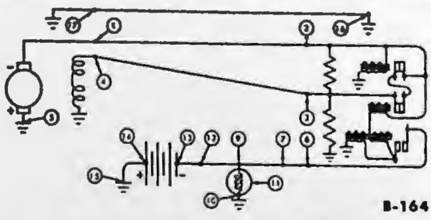

Fig. 1—Generating System with Battery Gauge (Voltmeter)

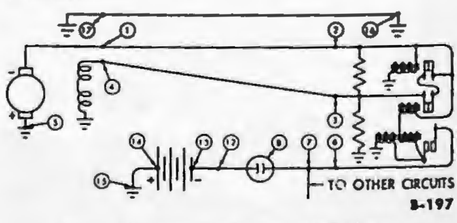

Fig. 2—Generating System with Charge Indicator (Ammeter)

July 17, 1947

Symptom 10999-C

Generator Output Low

Schematic drawings of the generating circuits are shown in the various figs. The numbers appearing in these drawings are to establish locations in the circuit.

EXAMPLE: *In the following instructions and in the drawings, ④ refers to the field terminal of the generator.*

The symptom applies only when, as a result of previous tests, it has been definitely established that the trouble is in the generator. Tests to establish or disprove this fact are a part of symptoms 10999-A and 10999-B, follow whichever of these that applies.

NOTE: *If the generator is new or has just been reconditioned, it may be necessary to polarise the field by removing the wire at the field terminal ③ and momentarily contacting the BAT terminal ⑥ of the regulator with this wire.*

1. PROCEDURE.

NOTE: *See generator specifications (subject 10000) to determine the rated amperage of the particular generator being tested in the following procedures.*

a. Check Generator Output.

Connect a jumper wire from the armature terminal ① to the field terminal ④ of the generator. Disconnect the ARM wire at the regulator ⑧. Run the engine approximately 1500 revolutions per minute. Connect the ammeter positive lead to the armature terminal of the generator ① and the negative lead to the battery negative post ⑪. Turn the headlights on, and press the starter button. Observe the amperage, and follow whichever of the following procedures (1) or (2) that applies:

(1) *MORE THAN RATED AMPERES.* If the ammeter shows the rated amperes or more, the generator is satisfactory. See Symptom 10999-B.

(2) *LESS THAN RATED AMPERES.* If the ammeter reading is less than the rated amperes, connect a jumper wire from the battery positive post ⑬ to the generator frame, and follow whichever of the following procedures *(a)* or *(b)* that applies:

(a) MORE THAN RATED AMPERES. If the ammeter reading is now more than the rated amperes, the trouble exists in the ground circuit. Clean and tighten all ground straps and generator bracket.

(b) LESS THAN RATED AMPERES. If the ammeter reading is less than the rated amperes, squirt some carbon tetrachloride on the generator brushes while the generator is running, and follow whichever of the following procedures *(1)* or *(2)* that applies:

(1) MORE THAN RATED AMPERES. If the ammeter shows the rated amperes or more, clean the commutator, and clean and/or replace the generator brushes.

(2) LESS THAN RATED AMPERES. If the reading is still less than the rated amperes, the trouble is either in the field circuit, the armature, or the commutator and brushes, follow both operations *a* and *b* below.

a. Check Field Circuit. Disconnect the ammeter positive lead from the armature terminal ③ of the generator, and stop the engine. Connect the positive ammeter lead to the generator field terminal ④ and the negative lead to the battery negative post ⑪. Amperage readings should be as shown in the specifications, Subject 10000.

If the field amperage is lower than normal, a broken wire or loose connection exists in the field coils. If the field amperage is high, the fields are shorted. In either case, the field coils must be replaced, however, make the following test before disassembling the generator:

b. Check Armature. Remove the generator belt. Connect a jumper wire from the generator field terminal ④ to the generator armature terminal ①. Connect an ammeter from the battery negative post ⑪ to the armature terminal of the generator ①. The generator should now run as a motor. Hold the generator pulley by hand, allowing the pulley to turn slowly. The pull on the generator pulley should be even, and the ammeter reading steady. As the armature is turned, a dead segment (open windings) can be felt, and will show lower amperage when open coil is brought under the brush. A partially open armature will show low and varying amperage. A grounded armature will show high amperage. Replace the armature if it is grounded or shorted. Examine the brushes and commutator to make sure the brushes are making good contact on the commutator. If the brush hold-down spring is within ⅛ inch from the brush holder, replace the brushes. Turn the commutator if required, and undercut the mica between the commutator segments.

Symptom 10999-D

High Charging Rate (Battery Fully Charged)

Schematic drawings of the generating circuits are shown in the various figs. The numbers appearing in these drawings are to establish locations in the circuit.

EXAMPLE: *In the following instructions and in the drawings,* ⑥ *refers to the BAT wire of the regulator.*

Light bulbs burning out frequently or excessive amount of water being used by the battery are all indications of high charging rate.

1. PROCEDURE.

a. Check Battery.

Determine if the battery is fully charged by one of the following methods (1) or (2) below.

(1) *CHECK SPECIFIC GRAVITY.* Check the specific gravity, adjusting the reading per temperature.

If the specific gravity is below 1.250 or if a variation of 25 points or more exists between the cell readings, charge the battery.

(2) *CHECK BATTERY CAPACITY.* Check the battery under high rate discharge, recharging it if under capacity is indicated.

b. Check Regulator Setting.

Remove the wire from the BAT terminal ⑥ at the regulator. Install a ¾-ohm resistor to the BAT terminal of the regulator, and clip the wire on the ¾-ohm resistor to a good ground. Connect the voltmeter negative lead to the armature terminal ① of the generator and the positive lead to ground. Start the engine and run it at approximately 1500 revolutions per minute. If the voltmeter reads more than the specified voltage shown in the generator specifications, Subject 10000, the voltage regulator must be adjusted (see Symptom 10999-E).

Symptom 10999-E

Generator Regulator Does Not Regulate

This procedure applies only after it has been established as a result of previous tests that the generator, battery, and balance of the circuit are satisfactory. If this has not been established, follow the symptom that applies (10999-A to 10999-D).

1. PROCEDURE.

a. Check Regulator Setting.

Connect the voltmeter negative lead to the generator armature terminal ① and the positive lead to ground. Remove the wire from the BAT terminal ⑥ at the regulator. Install a ¾-ohm resistor on the BAT terminal of the regulator, and clip the wire on the ¾-ohm resistor to a good ground.

NOTE: *Use care not to short the battery terminal to the regulator case when disconnecting the battery wire. Arcing at this point can be avoided by temporarily disconnecting the battery ground strap.*

(1) *CHECK CUT-IN VOLTAGE.* Start the engine. Slowly and steadily increase the engine speed, at the same time observe the voltage at which the cut-out closes. This will be indicated by a sudden drop of the voltmeter pointer.

The last reading obtained just before the reading drops will be the cut-in voltage of the cut-out.

NOTE: *In some cases it will be found that the idling speed of the engine will be above the speed at which the cut-out cuts in. In these cases it will be necessary to slow the idling speed for the test.*

The cut-in voltage should be as shown in the specifications, Subject 10000. If the cut-in voltage is not within these limits, adjust and/or replace the cut-out points.

(2) *CHECK VOLTAGE REGULATION.* With the voltmeter still connected, as in the previous test, increase the engine speed to approximately 1500 revolutions per minute. Observe the reading on the voltmeter. If reading is not within the specified limits, adjust the voltage regulation.

(3) *CHECK CURRENT LIMITER.* Disconnect the ¾-ohm resistor from the BAT terminal ⑥ of the regulator. Connect the ammeter positive lead to the BAT wire which was removed from the regulator. Connect the ammeter negative lead to the BAT terminal ⑥ of the regulator. Turn the headlight switch on COUNTRY beam. Increase the engine speed to 1500 revolutions per minute. Press the starter button and observe the ammeter reading. If the reading is not within the limits specified in subject 10000, adjust the current regulation.

Reduce the engine speed until the amperage reading drops to approximately 5 amperes. As the engine speed is reduced further, a negative reading will be obtained at least momentarily until the cut-out points open. This negative reading is reverse current, and should not exceed 8 amperes.

Remove the meters and connect the wire to the BAT terminal of the regulator.

December 7, 1947

11002—STARTING MOTOR

Part Number	Normal Engine Cranking Speed	Maximum Torque		Teeth In Pinion	Teeth In Ring Gear	Gear Ratio	Amperage Idle
		Pound Feet	Load (Amp.)				
18-11002	100	14	550	10	112	11.2	45–60
52-11002	100	14	550	9	122	13.6	45–60
70-11002	130	14.8	375	10	112	11.2	40–50
9N-11002	100	14	550	9	122	13.6	45–60
09B-11002	130	14.8	375	10	112	11.2	40–50
29AS-11002	100	14	550	10	112	11.2	45–60
26H-11001	100	14	550	10	112	11.2	45–60
SE-51-11002	130	14	375	10	112	11.2	70–85

11005—ARMATURE

Part Number	Used On
18-11005	18-10002
52-11005	9N-10002, 52-10002
70-11005	70-10002
09B-11005	09B-10002
29AS-11005	29AS-10002
26H-11005	26H-10001

11055—BRUSHES

Part Number	Mfg. Length Min. (Inches)	Wear Limit (Inches)	Brush Spring Tension (Ounces)
18-11055	0.455	0.330	20-22

11083-5—FIELD COILS

Part Number	Used On
18-11083–L.H. 18-11085–R.H.	All (except 09B)
70-11083–L.H. 70-11085-R.H.	09B-11002

11350—STARTER DRIVE

Part Number	Type	Teeth in Pinion	Used On
B-11350	Spring	10	18-11002
52-11350	Barrel	9	52-11002
52-11350-B	Barrel	9	52-11002
52-11350-C	Barrel	9	9N-11002
29B-11350	Barrel	9	09B-11002
91A-11350	Rubber	10	18-11002

PRINTED IN U.S.A. July 7, 1947

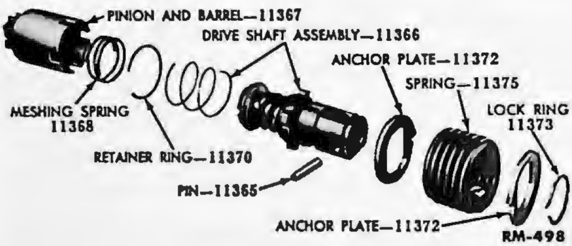

Fig. 1—Barrel-Type Starter Drive

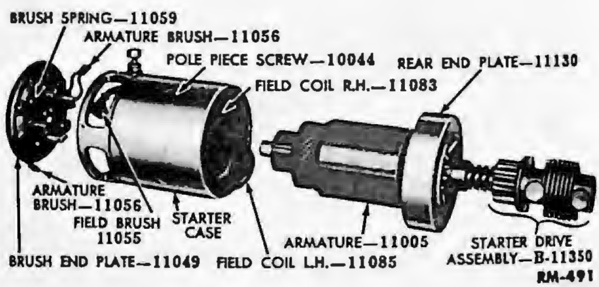

Fig. 3—Starting Motor

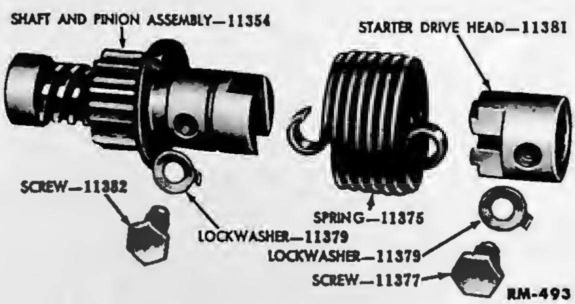

Fig. 2—Spring-Type Starter Drive

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B & S STARTER DRIVE

This drive (Fig. 1) operates through a resilient rubber cushion (No-springs) which absorbs shocks and starting noises and prolongs the life of the starting motor and ring gear.

The drive is made in one integral unit—nothing to adjust. Only service parts are No. 91A-11377 Bolt and No. 91A-11379 Tang Washer.

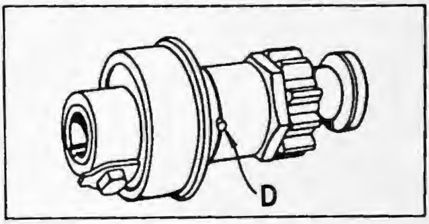

Fig. 1

How to Remove Starter Drive From Shaft

1 Pull out entire starting motor unit and place on work bench.

2 Straighten tang of washer 'A' with pliers and remove bolt 'B'. (See Fig. 2).

3 To remove Woodruff Key 'C' push starter drive toward starting motor to expose key (See Fig. 2).

4 After key is removed pull starter drive off of shaft.

Clean and Lubricate

Never DIP OR IMMERSE in oil, gasoline, benzine or any type of cleaning fluid when cleaning starter drive.

1 Hold starter with pinion down as shown in Fig. 3.

2 Move pinion forward to expose threads.

3 Squirt Kerosene on threads and tube at base of threads—then move pinion back and forth five or six times to distribute Kerosene over all surfaces.

4 Run pinion all the way down—blow excess Kerosene off threads—run pinion back on threads and wipe excess Kerosene off the tube.

5 A special zinc oxide containing thin grease (M-4648-B) is used in production and has been found to be the best material for lubricating the starter drive. However 10W oil can be used. Apply lubricant on threads and on tube and washer at base of threads. Move pinion back and forth to distribute oil. No other lubrication is required.

The rubber cushion contained in the Starter Drive housing or cup is protected against oil, grease or grit while in service.

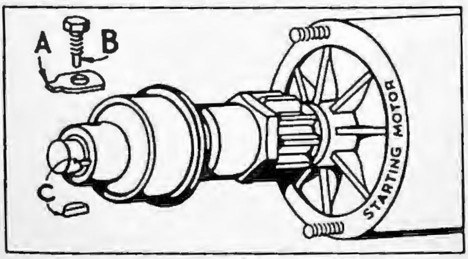

Fig. 2

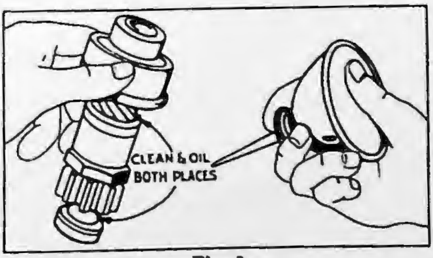

Fig. 3

ABOVE APPLIES TO MODELS:

STARTING 1940 EXCEPT 4 CYL.

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Aug. 1, 1941

To Check

Starter drive operates correctly if threads and tube are clean and properly lubricated so that pinion slides back and forth FREELY on threads.

Heavy oil, grease or grit on threads or tube prevents normal action of Starter Drive.

If starter will not function when installed, after cleaning and lubricating, check the following:—

1 Starter motor for electrical and mechanical troubles. Brushes, Armature, etc.
2 Battery.
3 Solonoid starter switch.
4 Electrical connections for good contacts.

Caution

Make no attempt to remove or adjust either pin or spring ring 'D' (Fig. 1). The spring ring and pin prevents pinion from moving forward into ring gear after motor has started.

ABOVE APPLIES TO MODELS:
STARTING 1940 EXCEPT 4 CYL.

Symtom 11999-A

Engine Will Not Crank When Starter Button Is Pressed

In most cases, the owner will have discharged his battery before calling for assistance, and is more interested in getting his engine started quickly than in knowing why he had the trouble. In every case when answering a service call away from the shop, take along a fully charged battery, with two heavy leads four feet long having suitable connectors, and follow the procedure starting with par. 1 below. A more complete diagnosis, starting with par. 2 below, can be made after the car is in the shop. If a booster battery is not available, follow the procedure starting with par. 2 below.

1. ROAD SERVICE PROCEDURE

Turn the ignition switch ON, and pull out the choke. Connect the negative lead of a fully charged battery to the cold side of the starting motor relay or to the starting motor terminal. Connect the positive lead of this battery to the negative post of the battery in the car. As soon as this connection is made, the starting motor should start cranking the engine. Follow whichever of the following conditions that applies:

CAUTION: *With a second battery as outlined here, the starting motor circuit becomes a 12-volt circuit (ignition remains at 6-volts) and is entirely independent of the starter switch or relay. Therefore, do not leave the battery connected in this manner longer than necessary, otherwise both batteries will discharge rapidly. Remove the positive lead of the booster battery from the car battery to break the circuit.*

a. If Engine Starts.

If the engine now starts, perform Operation MA-1-B (Preventive Maintenance) to avoid future starting failures.

b. If Starting Motor Spins.

If the starting motor spins but the engine does not crank, the starting motor drive is defective.

c. If Engine Now Cranks But Does Not Start.

If the engine now cranks but does not start, the trouble is in the engine and not in the starting circuit.

d. If Engine Does Not Crank.

If the engine does not crank, the trouble is either in the engine or in the starting circuit, and the vehicle should be towed to the shop for a more complete diagnosis.

2. DIAGNOSIS PROCEDURE

A complete diagnosis of the starting system is given in the following par. This procedure takes into account all possible troubles which might cause starting system failure.

Before proceeding with this symptom, check the condition of the battery, and recharge or replace the battery if it is low in charge or capacity. Press the starter button and follow whichever of the following procedures that applies:

a. If Engine Starts.

If the engine now starts, follow the procedure given in par. 3 to avoid future starting failures.

b. If Starting Motor Spins.

If the starting motor spins, see symptom 11999-B.

c. If Engine Cranks at Normal Speed but Does Not Start.

If the engine cranks at normal speed but does not start, the trouble is in the engine and not in the starting circuit, see symptom 6999.

d. If Engine Cranks Slowly.

If it has been determined that the battery is in satisfactory condition and the engine still cranks slowly, proceed with symptom 11999-C.

NOTE: *If this condition exists in sub-zero weather, it is advisable to check the viscosity of the engine oil and dilute if necessary, as described in par. 3.*

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March 8, 1948

e. If Engine Does Not Crank But Starter Relay Clicks.

If the engine does not crank but a click is heard at the starter relay when the starter button is pressed, proceed with subpar. f (3) below.

f. If Engine Does Not Crank and Starter Relay Does Not Click.

If the engine does not crank and a click is not heard at the starter relay, proceed as follows:

(1) *GROUND STARTER BUTTON.* Ground the starter button wire to the instrument panel with a screw driver or jumper wire. Press the starter button. If the starter relay now clicks, replace the starter button. If a click is not heard, proceed as follows:

(2) *GROUND STARTING MOTOR RELAY.* Ground the starting motor relay terminal to which the small wire is attached. If the engine now cranks, the wire from the starter relay to the starter button is at fault and must be replaced. If the engine does not crank, proceed as follows:

(3) *CONNECT JUMPER WIRE ACROSS STARTER RELAY TERMINALS.* Using a battery cable or No. 2 wire as a jumper wire, connect it across the relay terminals. If the engine now cranks replace the starter relay. If the engine still does not crank, proceed as follows:

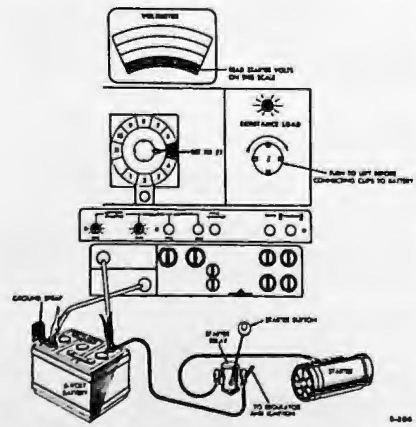

Fig. 1—Checking Voltage Drop at Battery, Using Diagnosis Test Set

(4) *CONNECT JUMPER WIRE FROM BATTERY TO STARTING MOTOR TERMINAL.* Using a battery cable or No. 2 wire as a jumper wire, connect it to the negative terminal of the battery and directly to the starting motor terminal. If the engine now cranks, replace or tighten the cable leading from the starter relay to the starting motor. If the engine still does not crank, proceed as follows:

(5) *TEST FOR OPEN CIRCUIT IN STARTING MOTOR.* Make the necessary adjustments on the diagnosis test set as shown in fig. 1. Connect the test set battery leads across the battery terminals (fig. 1). Press the starter button, and observe the voltage reading. If the voltage drop is less than one volt, an open circuit exists in the starting motor. Remove and repair or replace the starting motor. If the voltage reading at the battery drops more than one volt when the starter button is pressed, proceed as follows:

(6) *CHECK FOR LOCKED STARTER DRIVE.* Put the transmission in high gear, and attempt to push the vehicle forward. If the vehicle will not move forward, the starter drive gear is locked. Rock the vehicle back and forth. The backward motion usually will release the gear. Loosening the bolts which secure the starting motor to the engine will also release the gear. If the engine still does not crank, proceed as follows:

(7) *CHECK FOR HYDROSTATIC LOCK OR SEIZED ENGINE.* Remove the spark plugs, and again attempt to crank the engine with the starting motor. If the engine now cranks, this is usually an indication that water is leaking into the cylinders. Remove the cylinder head and inspect the gasket or head for cracks. Also examine the cylinder block for cracks, particularly around the valve ports. Make the necessary repairs, and install the cylinder head. If the engine still does not crank, proceed as follows:

(8) *REMOVE STARTING MOTOR AND CONNECT TO FULLY CHARGED BATTERY.* Remove the starting motor and connect it to a fully charged battery. If the starting motor does not run, repair or replace the starting motor. If the starting motor runs satisfactorily, the engine is seized and must be disassembled and any faulty parts replaced.

March 8, 1948

3. PREVENTION OF FUTURE STARTING FAILURES

To avoid future starting failures, perform Operation MA-1-B, preventive maintenance service, if this service is due or nearly due. This operation will eliminate most of the contributing causes to starting failures. During this operation, pay particular attention to the battery capacity (in addition to its state of charge), the generator regulator setting, the viscosity of the engine oil, as well as any other factors that may have contributed to the trouble.

a. Instruct Owner.

If the battery was low in charge, advise the owner to have his battery checked regularly, recharging it as required. Instruct the owner to hold down the clutch pedal when starting the engine, and recommend the correct viscosity oils for engine, transmission, and differential. Show the owner how to overcome flooding by cranking the engine with the throttle open to exhaust the rich gases. Instruct the owner how to dilute the engine oil if the engine must be started frequently at below zero temperature (subpar. *b* below).

b. Sub-zero Cranking.

Where temperatures from 10° F. below zero to 65° F. below zero prevail, dilute the engine oil by adding 1 quart of gasoline. This gasoline should be added while the engine is still warm. Stop the engine and add oil of S.A.E. 10 or 10W viscosity up to the FULL mark. Then add 1 quart of gasoline. This will bring the level of the oil higher than normal. This level should be marked on the gauge for future reference.

(1) *DILUTION INCREASES OIL CONSUMPTION.* The pressure of a large percentage of light diluent will increase oil consumption, and for that reason the oil level should be checked frequently. If the vehicle is operated 4 hours or more at operating temperature, redilution will be necessary if it is anticipated the vehicle will be left standing unprotected for 5 hours or more.

(2) *REDILUTION OF ENGINE OIL.* This can be accomplished by adding oil of S.A.E. 10 or 10W viscosity to the FULL mark, then add gasoline to the dilution mark on the gauge described in subpar. (1) above. Start the engine and allow it to run for 2 minutes to assure mixing of the oil and gasoline. This mixture will have a very low viscosity for easy starting, and the gasoline will vaporize and pass off very quickly when the engine is running, leaving the oil at its original viscosity.

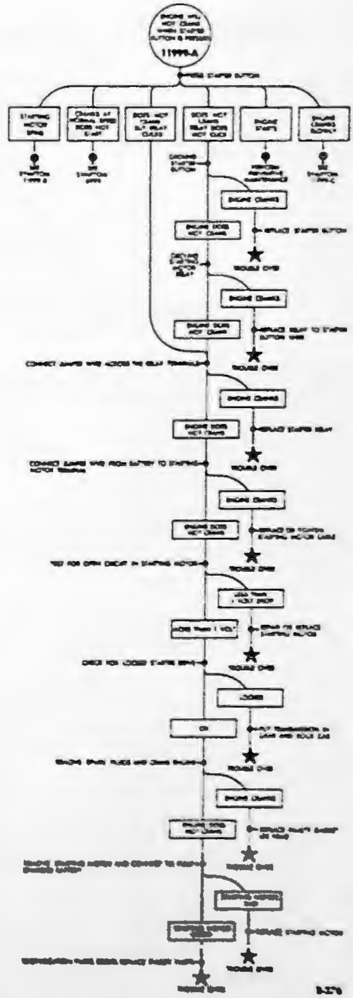

Fig. 2—Starting System Road Map

Symptom 11999-B

Starting Motor Spins But Does Not Crank Engine

If the starting motor spins and does not engage with the flywheel gear, remove the starting motor, and clean the starter drive and/or replace worn or damaged parts as required.

CAUTION: *Do not oil the starter drive. Clean the starter drive in a solvent. It should work freely when dry.*

Symptom 11999-C

Engine Cranks Slowly With Clutch Released

Make certain that the viscosity of the engine oil is correct for the prevailing temperature. If recent major repairs have been made, the engine may be tight. Test the state of charge and condition of the battery. Replace or recharge the battery if necessary. If the battery is satisfactory, remove the cable from one side of the starter relay, and contact the loose end of the cable against the terminal on the other side of the relay. Follow whichever of the following conditions that applies:

a. If Cranking Speed is Now Normal.

If cranking speed is now normal, replace the starter relay.

b. If Cranking Speed is Still Slow.

If the cranking speed is still slow, check the condition of the wires and connections in the starting circuit. Replace wires or tighten connections as required. If the engine still cranks slowly, repair or replace the starting motor.

March 8, 1948

12100-12127—DISTRIBUTOR GENERAL

Part Number	Initial Advance Crankshaft Degrees BTC	Distributor Advance W.O.T. Crankshaft Degrees Min.	Max	Engine R.P.M.	Total Advance W.O.T. Crankshaft Degrees Min.	Max.	Breaker Arm Spring Tension (Ozs.)	Contact Spacing (Inches)	Dwell Contact (Percent) At Idle Speed L.H.	R.H.	Total
9N-12100	0	24		2000	24		20-24	0.014-0.016			37-42
40-12127-A	4	21	23	3000	25	27	20-24	0.012-0.014	60	55-65	77-82
40-12127-B	4	15	17	3000	19	21	20-24	0.012-0.014	60	55-65	77-82
68-12127	4	15	17	1900	19	21	20-24	0.014-0.016	50	45-55	78-85
78-12127	4	15	17	1900	19	21	20-24	0.014-0.016	50	45-55	78-85
11A-12127	4	21	24	3450	25	28	20-24	0.014-0.016	50	45-55	78-85
21A-12127	4	21	24	3450	25	28	20-24	0.014-0.016	50	45-55	78-85
5GA-12127	1	17	19	2500	18	20	20-24	0.014-0.016			57-62
1GA-12127	1	17	19	2500	18	20	20-24	0.014-0.016			57-62
59A-12127	4	21	24	3450	25	28	20-24	0.014-0.016	50	45-55	78-85
16H-12127	2	22	24	3400	24	26	20-24	0.014-0.016	57-62	57-62	
7HA-12127	0	21	23	4000	21	23	17-20	0.024-0.026			57-62
7RA-12127	2	15	17	4000	17	19	17-20	0.014-0.016			60-65
8EL-12100	4	22	26	4000	26	30	17-20	0.015-0.018			58-63
8EQ-12127	4	20½	22½	3200	24½	26½	17-20	0.014-0.016			60-65
8MB-12127	0	18½	20½	3200	18½	20½	17-20	0.024-0.026			57-62

12100-12127—DISTRIBUTOR ADVANCE CHARACTERISTICS (CENTRIFUGAL)

Part Number	Vacuum Brake Released: Distributor R.P.M.	Vacuum Brake Released: Distributor Degrees	Vacuum Brake On: Distributor R.P.M.	Vacuum Brake On: Distributor Degrees	Vacuum Brake On: Vacuum (Inches of Mercury)
9N-12100					
40-12127-A	200 400 1500	0 – ½ 3 – 4 10½–11½	425	0-0.5	0
40-12127-B	200 600 1500	0 – ½ 3½– 4½ 7½– 8½	425	0-0.5	0
68-12127	200 400 950	0 – ½ 2¾– 3¾ 7½– 8½	1000	1.5-2.5	0
78-12127	200 400 950	0 – ½ 2¾– 3¾ 7½– 8½	1000	1.5-2.5	0
11A-12127	200 400 600	0 – 1 6½– 8 10½–12	200 1000	0-1.0 4.5-6.0	0 1.6
21A-12127	200 400 600	0 – 1 6½– 8 10½–12	200 1000	0-1.0 4.5-6.0	0 1.6
5GA-12127	200 400 475	0 – ½ 6½– 7½ 8½– 9½	200 600 1000	0-0.5 2.0-2.5 6.0-7.0	0 0.4 1.2
1GA-12127	200 400 475	0 – ½ 6½– 7½ 8½– 9½	200 600 1000	0-0.5 2.0-3.0 6.0-7.0	0 0.4 1.2
59A-12127	200 400 600	0 – 1 6½– 8 10½–12	200 1000	0-1.0 4.5-6.0	0 1.6
16H-12127	200 400 600	0 – ½ 7½– 8½ 11 –12	200 1000 1400	0-0.5 5.0-6.0 8.5-9.5	0.2 1.1 2.1

12024-12036—COIL

Part Number	Primary		Secondary	
	No. Turns	Resistance Ohms	No. Turns	Resistance Ohms
18-12024-A3	176	0.505–0.535	12500	3350–3800
68-12024	176	0.505–0.535	12500	3350–3800
78-12036	170.5	0.470–0.510	16500	5800 Min.
81A-12036	170.5	0.470–0.510	16500	5800 Min.
9N-12024	170.5	0.470–0.510	16500	5800 Min.
1GA-12024	170.5	0.470–0.510	16500	5800 Min.
H-12024	195	0.530–0.590	14500	4000–4400
7RA-12029-A1	240	1.05–1.15 (75°F.)	21000	4100 (75°F.)

12100-12127—DISTRIBUTOR ADVANCE CHARACTERISTICS (VACUUM)

Part Number	Distributor R.P.M.	Distributor Degrees	Vacuum (Inches of Mercury)
7HA-12127	200	0 – 0	0
	500	1¾– 3	0.4
	1000	5½– 6¾	1.4
	1000	11½–13	5.5
	1500	8½– 9¾	2.9
	2000	10½–11½	4.1
7RA-12127	200	0 – 0	0
	500	1¼– 2¼	0.4
	1000	4¼– 5¼	1.7
	1500	6¼– 7¼	2.85
	2000	7½– 8½	3.7
8EL-12100	200	0 – 0	0
	500	1¾– 3¾	0
	1000	6 – 8	0
	1500	10 –12	0
	2000	11 –13	0
	800	4¼– 6¼	8.0
	800	11 –13	14.0
8EQ-12127	200	0 – 0	0
	400	1½– 3	0.25
	1000	7¼– 8¼	1.3
	1600	10¼–11¼	2.7
8MB-12127	200	0– 0	0
	500	2– 3	0.4
	1000	6¼– 7¼	1.3
	1400	10½–12	3.6
	1600	9¼–10¼	2.6

12120—UPPER OR FRONT BUSHING

Part Number	Max. Inside Diameter (Inches)	
	Mfg.	Wear Limit
40-12120	0.4375	0.4395
1GA-12120	0.377	0.379
7RA-12120	0.469	0.471

12130—DISTRIBUTOR HOUSING

Part Number	Max. Vacuum Brake Bore Diameter (Inches)	
	Mfg.	Wear Limit
68-12130	0.7505	0.751
78-12130	0.7505	0.751
21A-12130-A	0.7505	0.751

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12132—LOWER OR REAR BUSHING

Part Number	Max. Inside Diameter (Inches)	
	Mfg.	Wear Limit
B-12132	0.5005	0.501
18-12132	0.863	0.8655
7RA-12132	0.4690	0.470
8EL-12132	0.5000	0.5015

12175—SHAFT

Part Number	Minimum Front Diameter (Inches)		Minimum Rear Diameter (Inches)		End Play (Inches)	
	Mfg.	Wear Limit	Mfg.	Wear Limit	Min.	Max.
40-12175-A	0.4365	0.4355	0.8625	0.861		
40-12175-B	0.4365	0.4355	0.8625	0.861		
68-12175	0.4365	0.4355	0.8625	0.861		
11A-12175	0.4365	0.4355	0.8625	0.861		
9N-12175	0.4367	0.436	0.8625	0.861		
21A-12175	0.3742	0.373	0.8625	0.861		
7HA-12175	0.4675	0.466	0.4675	0.466	0.003	0.005
7RA-12175-C	0.4675	0.466	0.4675	0.466		
8EL-12175					0.003	0.010
8EQ-12175	0.4675	0.466	0.4675	0.466		

12176—CAM AND WEIGHTS ASSEMBLY

Part Number	Clearance Weights and Pivot Pin (Inches)	
	Min.	Max.
40-12176-A	0.006	0.010
40-12176-B	0.006	0.010
68-12176	0.006	0.010
11A-12176	0.006	0.010
1GA-12176	0.006	0.010

12192-12225—VACUUM CONTROL SPRING

Part Number	Length (Inches)	Compression or Tension (Ounces)
18-12225-B	0.875	60–69
7RA-12192	0.828	54–61
7HA-12225	0.754	34.5–37.5
8BA-12225	0.894	169–183
8EL-12225	1.60	72.0–88.0
8EQ-		
8EQ-		

12200-12201—ROTOR

Part Number	Rotor Gap		Min. Center of Shaft to End of Electrode (Inches)	
	Max.	Min.	Mfg.	Wear Limit
9N-12200	0.008	0.006	1.275	1.272
1GA-12200	0.0055	0.0035	0.9955	0.994
21A-12200	0.0055	0.0035	1.455	1.452
59A-12200	0.0105	0.007	1.270	1.268
48-12201	0.0105	0.0035	1.242	1.240
68-12201	0.0125	0.0065	1.0525	1.051
7RA-12200	0.0105	0.007	1.270	1.268
8EL-12200	0.0205	0.00025	1.2425	1.241

12220—VACUUM BRAKE PISTON

Part Number	Diameter (Inches)	
	Mfg.	Wear Limit
18-12220	0.7493	0.7485

12300—CONDENSER

Part Number	Capacity Microfarads
B-12300	0.20-0.25
18-12300	0.33-0.36
68-12300	0.33-0.36
78-12300	0.33-0.36
81A-12300	0.33-0.36
91A-12300	0.29-0.32
1GA-12300-B	0.25-0.32
H-12300	0.31-0.34
7RA-12300-B	0.21-0.25
8EL-12300	0.20-0.25

12405—SPARK PLUGS

Part Number	Type	Size	Gap (Inches)		Torque (Ft.-Lbs.)	
			Can Type Coil	Plastic Type Coil	Cast Iron Head	Aluminum Head
18-12405-B	C-4	7/8"		0.023-0.027	34-38	
40-12405-A	C-7	18 mm		0.023-0.027	28-32	24-28
40-12405-C3	7	18 mm		0.025-0.028	28-32	24-28
48-12405	6 com.	18 mm		0.025-0.028	28-32	24-28
9N-12405	H-10	14 mm		0.025-0.028	24-30	
29B-12405	J-10 com.	14 mm		0.025-0.028	24-30	
01T-12405	H-9 com.	14 mm	0.025-0.028	0.025-0.028	24-30	
7RA-12405	H-10	14 mm	0.029-0.032		24-30	

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IGNITION SYSTEM

Under this subject number the **entire ignition system is dealt with as a unit.**

Considered as a unit, the ignition system services for each type of car fall in two groups, namely: **Ignition services on the car** (see **opr. 12000-A**) and **Ignition services with the distributor** and coil assembly **removed from the car** (see **opr. 12000-B**).

The completeness of the ignition service you render will depend on the equipment you have to work with and the exactness with which you follow the procedures outlined.

The only fully approved method of timing the distributors is on the Distributor stroboscope.

Since the battery is a part of the ignition system and must be tested before a positive recommendation can be made with regard to the ignition system.

The distributor used on all Ford, Mercury, Lincoln-Zephyr and Lincoln, except K Series, is located at the front of the engine and is driven direct by the camshaft, thus eliminating many parts and the consequent back lash, etc.

The spark timing is automatically advanced or retarded by the centrifugal governor weights or springs. With the exception of the 4 cyl. and "K" Series Lincoln distributor a vacuum brake automatically retards the spark timing in direct proportion to the load.

The current for igniting the gas mixture in the cylinders is provided by the storage battery. The ignition coil transforms the low tension current to a high tension current of sufficient voltage to bridge the gap between the points of the spark plugs. The circuit breaker points interrupt the flow of low tension current at regular intervals, while the distributor rotor distributes the high tension current to each spark plug in proper firing order.

While the circuit is closed, the coil builds up a high tension charge and a spark is produced as soon as the circuit is broken. The longer the circuit is closed the "hotter" the spark will be. This is referred to as the "dwell."

The circuit breaker used on the V-8 differs from the conventional in that the cam used has 8 lobes and that one set of contact points opens the circuit whereas the other merely closes the circuit. By this arrangement an exceptionally long "dwell" is obtained and the necessity of synchronizing the timing of the spark for the two banks of cylinders is removed.

The only fully approved method of setting the distributor points is with the distributor stroboscope as outlined in opr. 12000-B.

Breaker Point Failure

Breaker point failure is caused by one or more of the following conditions:

A Under-capacity condenser.

B Condenser not properly grounded.

C Generator voltage too high.

D Faulty battery connections, particularly the ground connection.

E Incorrect spacing.

F Excessive oil on the points and the engine is the most likely source of this. Oil leakage is usually traceable to distributor bolts not having been drawn down sufficiently tight.

Instances have likewise been found where excessive grease had been used on the distributor gasket at time of installation. This grease melts from the engine heat and works its way into the points.

Too much cam grease or the wrong kind may cause distributor point trouble. A **thin** film of No. M-4601-Ford distributor cam grease should be used for this purpose.

EQUIPMENT USED

HEYER-HI-FORD LABORATORY TEST SET
HEYER-HI-DFZ DISTRIBUTOR STROBOSCOPE
HEYER-HI-BRS ATTACHMENT

ABOVE APPLIES TO MODELS:

ALL

Printed in U.S.A.

May 1, 1941

Vacuum Brake

The vacuum brake consists of a plunger or piston which is held against the braking surface of the governor plate by a spring of adjustable tension. As the rapidity of combustion is dependent on the degree of compression, the need of a retarded spark for quick acceleration or power is not dependent entirely on engine speed.

The requirements for retarded spark at any speed are when the vacuum in the carburetor throat is extremely low. As an example: should the car be travelling at a speed of 20 to 25 miles an hour, the throttle valve would be but partially open and would restrict the passage of air into the manifold which would result in a comparatively high vacuum in the intake manifold causing the air in the distributor suction line to be drawn into the manifold.

This suction draws the vacuum brake piston upward compressing the vacuum brake operating spring. When the brake piston is in this position, the brake is inoperative and the timing is automatically advanced by the centrifugal governor weights.

However, should the throttle valve be fully opened suddenly, the restriction to the air entering through the carburetor throat would be removed and the vacuum in the intake manifold would immediately drop. The operating spring then pushes the piston downward against the governor plate retarding the spark.

As the engine speed increases to the speed required by the throttle valve position, its increased demand for air again causes a partial vacuum to be formed; the air is then again drawn from the suction line and the vacuum brake is again inoperative.

The vacuum brake setting can be accurately set while the distributor is off the car by means of the distributor stroboscope as outlined under operation 12000-B. This adjustment will remove the necessity of road testing or adjustment in most cases.

Adjust Vacuum Brake on the Road

The vacuum brake should be adjusted with just enough tension to eliminate the sharp pinging of the engine under load.

1 **Inspect vacuum brake piston** for any indication of its binding in the distributor body (the vacuum brake **must work freely with no bind**). Apply a few drops of engine oil to the piston.

2 **Set** vacuum brake **so** that the **engine pings under load.**

3 Next **adjust until ping is removed.** Avoid screwing the vacuum brake adjusting nut down more than is actually required to remove the ping or the spark will not advance correctly.

4 **In** describing the adjustment of the vacuum brake **above it is assumed that the basic timing** as explained in operation 12000-B **is correct.**

If satisfactory results cannot be obtained after above procedure is followed **distributor should be removed, thoroughly checked and timed.**

ABOVE APPLIES TO MODELS:	EQUIPMENT USED:
ALL	HEYER-HI-FORD LABORATORY TEST SET HEYER-HI-DFZ DISTRIBUTOR STROBOSCOPE HEYER-HI-BRS ATTACHMENT

May 1, 1941

Printed in U.S.A.

R, H, MB, and EQ Series Ignition Systems

With the introduction of the late 1947 6-cylinder passenger car engine, the 1948 6-cylinder and 8-cylinder truck engines and all 1949 passenger car engines, the loadomatic type distributors have replaced the centrifugal-governor-with-vacuum-brake type.

Ignition trouble shooting procedures are covered under Bulletin Subject No. 12999, and ignition specifications are covered under Bulletin Subject No. 12000, Pages 1, 2, 3 and 4.

1. DESCRIPTION

The distributor, coil, ignition harness, and spark plug arrangement for each type of ignition system is shown in figures 1, 2, and 3. The ignition circuit diagrams for the new systems are shown in figures 21 and 22.

a. Locations.

The H and MB series distributors project from the left side of the engine, and the drive shaft lies between No. 3 and No. 4 cylinders. This drive shaft fits into splines in the oil pump shaft which is driven by the camshaft.

The R series distributor, mounted in a vertical position at the front right side of the engine, as shown in figure 16, is driven by a gear on the camshaft.

The EQ series distributor, mounted in a vertical position at the top rear of the engine, is driven by the camshaft through an idler gear and the oil pump drive shaft.

b. Spark Advance Operation.

One side of the distributor vacuum unit diaphragm is linked mechanically to the breaker plate and the other side is connected by a vacuum line to the carburetor.

The carburetor has a vacuum passage with openings at both the venturi tube and a point just above the throttle plate, as shown in figure 4, so that the vacuum in the distributor line is at all times a combination of the carburetor throat and venturi vacuums. The lower opening is above the throttle plate when the engine is idling, and at idle speed the spark is retarded.

Under conditions of acceleration, the vacuum at the venturi increases as the engine speed increases, however, the manifold vacuum (vacuum at the carburetor throat) decreases considerably from the road load vacuum. The net result of these two changes is to lower the vacuum at the distributor diaphragm and the springs retard the spark advance from its road load setting. As the vehicle speed increases, the venturi vacuum and also the manifold vacuum continue to increase.

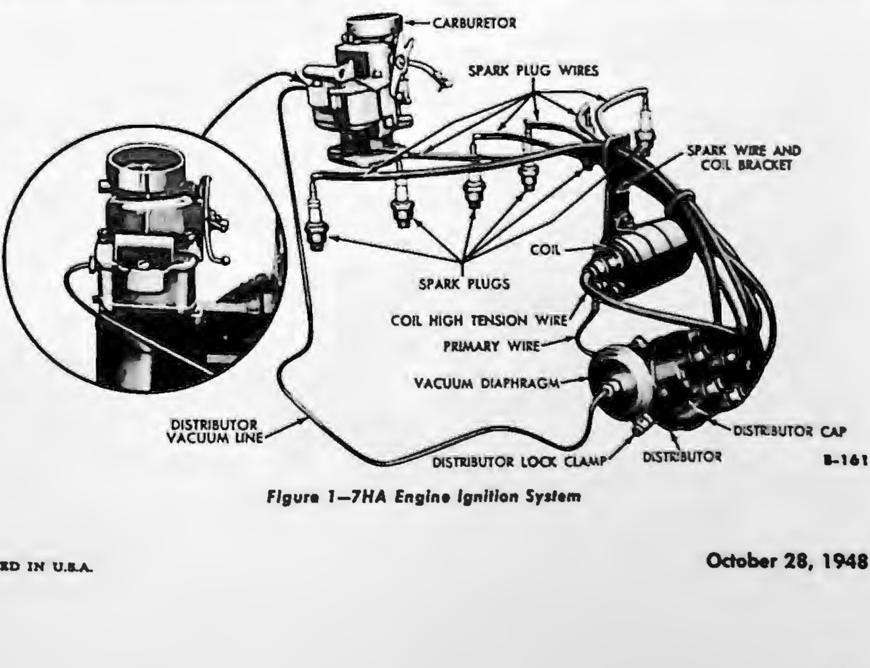

Figure 1—7HA Engine Ignition System

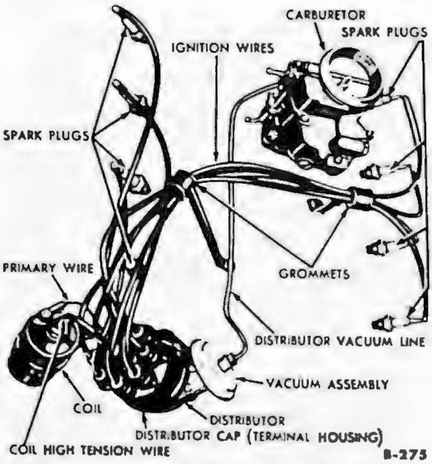

Figure 2—8RT Engine Ignition System

Under normal road load or part throttle operation at any speed, the vacuum at B is high, and the spark

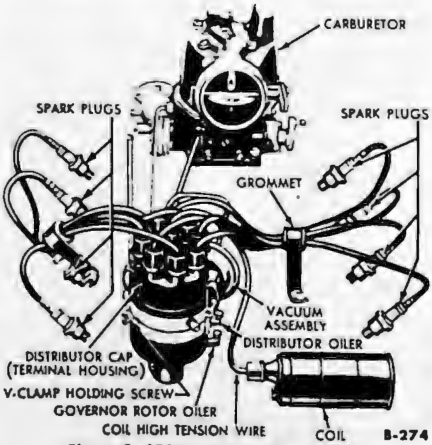

Figure 3—8EQ Engine Ignition System

will become fully advanced at 18 to 35 miles per hour. This permits correct advance at low speeds without the limitations encountered with governor weights.

The spark advance characteristics are controlled by two breaker plate springs working against the distributor diaphragm (fig. 14). Any reduction in vacuum on the distributor diaphragm will allow these two springs to retard the spark in proportion to the reduction in vacuum.

c. Spark Plug Wires.

It should be noted (figs. 1, 2, and 3) that the spark plug wires are supported by strap type brackets and are not encased in a conduit. Grommets are used in the brackets to protect the ignition wire.

d. Coils.

The metal can type ignition coil has replaced the plastic case type coil. This permits the coil primary to be wound on the outside of the coil assembly, and incorporates the correct primary resistance, eliminating the series resistor formerly used in the primary circuit.

The one coil assembly (7RA-12029) is now used on all engines except those equipped with a 12-volt system.

The MB series ignition system uses a 12-volt coil containing a resistor for the primary winding in the base.

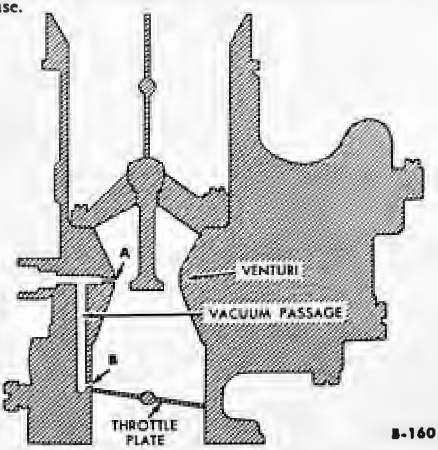

Figure 4—7HA Carburetor Vacuum Passage

2. REMOVAL AND REPAIR

The distributor should be removed and repaired if it has excessive breaker plate wobble. This condition would produce erratic timing.

The procedures for removing, disassembling, and assembling the distributor are outlined below.

a. Distributor Removal.

Unsnap the two clamps which are used to secure the distributor cap to the distributor, and remove the cap. Disconnect the primary wire and vacuum line. Loosen the distributor clamp lock screw or distributor hold-down bolt. Lift the distributor assembly from the engine.

NOTE: *Before removing the distributor from an engine which is timed correctly, be sure to scribe a mark on the distributor housing indicating the position of the rotor. The distributor can be reinstalled when the rotor is in line with the mark without rotating the engine to obtain the proper timing.*

The distributor head used on the engines equipped with governors may be removed from the governor rotor body by loosening the V-clamp at the intersection of the distributor head and the governor rotor body. See Bulletin Subject 9510, Page 61, for a description of the rotor body.

b. Disassembly.

To install new bushings, it is not necessary to remove the vacuum unit or the ground and primary wires from the housing if these are in a satisfactory condition.

(1) *R. SERIES.* If the bushings are removed from the housing, they must always be replaced with new bushings.

(a) SHAFT AND CAM ASSEMBLY REMOVAL. Position the distributor on the tool No. 12131-N, shown in figure 5, file off the rivet head, and drive out the drive gear rivet with a punch. Remove the drive gear from the distributor shaft, using the gear puller, tool No. 12390-N, figure 6, and lift off the spacer. Slide the distributor shaft out of the distributor housing.

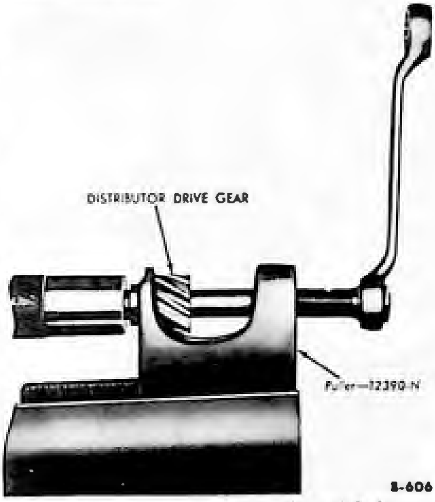

Figure 6—Removing the Drive Gear, R Series Distributor

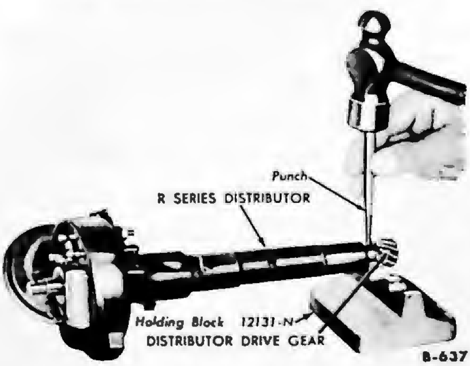

Figure 5—Driving Out the Drive Gear Rivet

(b) BREAKER PLATE. Place the distributor housing in the holding block, tool No. 12132-N-2, and clamp the tool in a vise.

Remove the two screws holding the breaker contact assembly on the breaker plate. Disconnect the primary wire and the condenser lead from the contact assembly primary terminal, and lift the contact assembly from the breaker plate.

Remove the hair-pin retainer attaching the vacuum unit rod to the breaker plate, and push the rod end out of the breaker plate.

Release the tension on the two return springs by rotating the adjustment posts to a position nearest to the stationary posts. Remove the two springs.

NOTE: *Do not stretch or bend the springs during their removal as this might make it difficult to obtain the correct spark advance adjustment.*

Remove the lock ring attaching the breaker plate to the upper bushing. Lift the breaker plate from the distributor housing.

Disconnect the primary and ground wires from the distributor housing.

(c) BUSHINGS. Drive the upper and lower bushings from the housing by using the split drift, tool No. 12132-N-1 (fig. 7).

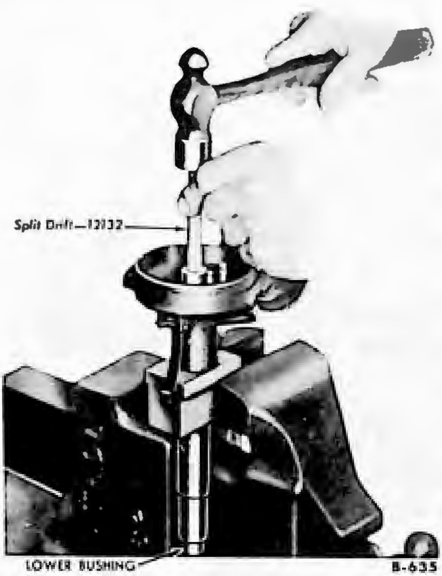

Figure 7—Removing Lower Bushing, R Series Distributor

(2) *H SERIES DISTRIBUTOR.* The only differences in construction between the H and R series distributors are in the housing and the drive shaft (fig. 8).

(a) SHAFT AND CAM REMOVAL. Position the distributor on the repair block, tool No. 12131-N, file off the rivet head, and drive out the collar rivet with a punch.

Slide the collar off the drive shaft, and remove the shaft and cam assembly from the distributor housing.

(b) BREAKER PLATE. To disassemble the breaker plate, follow the procedure described in subparagraph (1) *(b)* above.

(c) BUSHINGS. To remove the bushings, follow the procedure in subparagraph (1) *(c)* above.

(3) *EQ AND MB SERIES.* Remove the screw and the distributor drive plate (fig. 9). Lift the cam and shaft assembly from the housing. Then follow the procedure for disassembling the R series distributor in suubparagraph (1) above, with the exception that these distributors are equipped with only an upper bushing.

c. Assembly.

The assembly procedures for the H, R, EQ, and MB distributors are given below. Be sure to test the condenser on the Ford stroboscope condenser tester before installing it on the breaker plate.

(1) *R SERIES.* The bushings are made of powdered bronze and must not be reamed.

(a) BUSHING INSTALLATION. To install new bush-

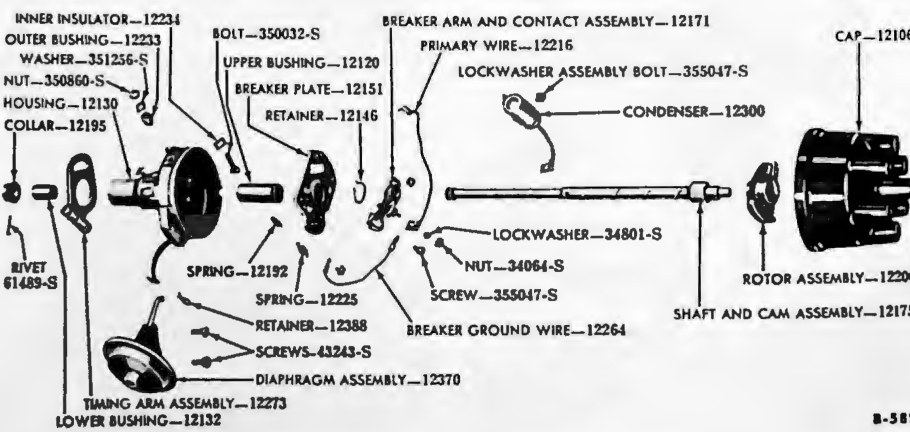

Figure 8—H Series Distributor, Disassembled

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ings, place a new lower bushing in position on the screw press, tool No. 12132-P. Place the distributor housing and the "A" spacer on the tool. Turn the T-handle until the lower bushing is flush with the distributor housing. Remove the T-handle and the "A" spacer. Position the upper bushing with the lock ring end up on the housing. Place the "A" spacer over the bushing as shown in figure 10 and turn the T-handle until the spacer bottoms firmly against the distributor housing.

Use the burnishing tool No. 12132-Q to properly size the upper and lower bushing (fig. 11).

(b) BREAKER PLATE ASSEMBLY. Install the ground wire and the primary wire in the distributor housing. Position the breaker plate in the housing, and install the lock ring to secure the breaker plate. Place the condenser on the breaker plate, install the holding screw, and tighten securely. Place the condenser lead, primary lead, lock washer, and nut on the contact assembly primary terminal, and securely tighten the nut.

Set the breaker contact assembly in position on the breaker plate. Be sure the pivot pin enters the

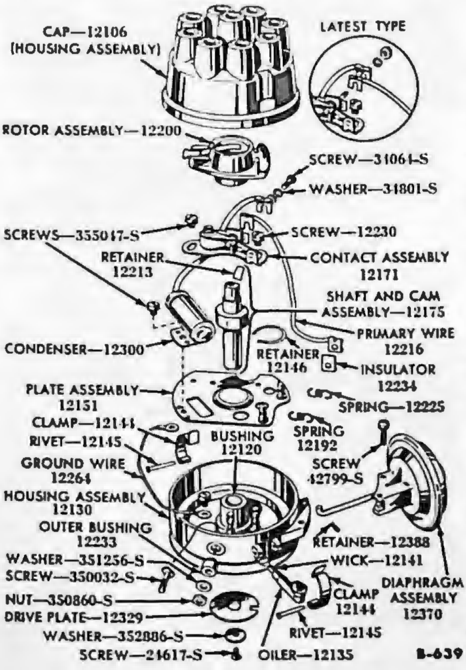

Figure 9—EQ Distributor, Disassembled

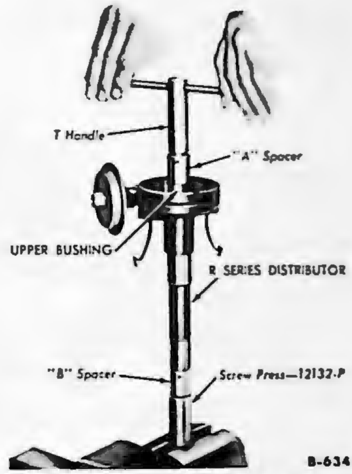

Figure 10—Installing Upper Bushing, R Series Distributor

hole in the breaker plate. Install the ground wire and the screw at the adjustment slot end of the breaker assembly and the screw and lock washer at the opposite end of the assembly.

Install the vacuum unit on the distributor housing and secure it with the two screws.

Install the two return springs on the adjustment and body posts. Connect the vacuum unit rod to the breaker plate, and attach it with the hair pin retainer.

(c) SHAFT. Slide the shaft into the housing, and place the thrust washer on the shaft at the bottom bushing. Place the drive gear on the end of the shaft, and align the mark on the gear with the mark on the end of the shaft. Press the gear on the shaft, being sure to maintain the proper shaft end clearance given in the Specification Service Bulletin, Subject No. 12000, Page 3. Set the distributor on the block, tool No. 12131-N, install the drive gear rivet, and peen the end of the rivet to secure.

(2) *H SERIES.* The repair procedure for the H Series distributor is similar to the R Series except for variation in construction of the distributor drive shaft and housing.

(a) BUSHING INSTALLATION. To install new bushings, follow the procedure given for the R Series distributor (subpar. (1) *(a)* above). Be sure to use the proper spacer.

(b) BREAKER PLATE. To assemble the breaker plate, follow the procedure given for the R Series distributor (subpar. (1) *(b)* above).

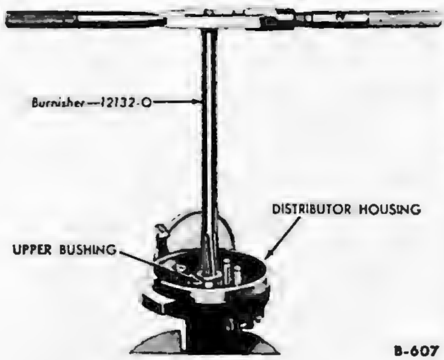

Figure 11—Burnishing Upper Bushing

(c) SHAFT. Slide the shaft into the housing, and place the collar in position on the shaft at the bottom of the housing. Install the collar rivet. Set the distributor on the block, tool No. 12131-N, and peen the end of the rivet to secure.

(3) *EQ AND MB SERIES.* The EQ and MB Series distributors use the same type vacuum unit and breaker plate as the H and R Series distributor. Use an additional spacer on the screw press to install the bushing in either the EQ or MB housing.

(a) BUSHING INSTALLATION. Only the upper bushing is used in these distributors. To install, follow the procedure given for the R Series distributor upper bushing (subpar. (1) *(a)* above).

(b) BREAKER PLATE. To install the breaker plate assembly, follow the procedure given for the R Series distributor (subpar. (1) *(b)* above).

(c) SHAFT. Place the shaft and cam assembly in the housing. Install the drive plate and secure it with the retaining screw.

3. CHECKING AND ADJUSTING SPARK ADVANCE

The following procedure requires the use of a distributor stroboscope (fig. 12).

a. Checking Spark Advance.

Install the distributor on a suitable distributor stroboscope.

Adjust the breaker contact spacing, follow the procedure that applies in paragraph 6 c. Check the breaker arm spring tension and adjust if required.

Set the distributor speed at 200 R.P.M., hold the distributor breaker plate against the stops in full

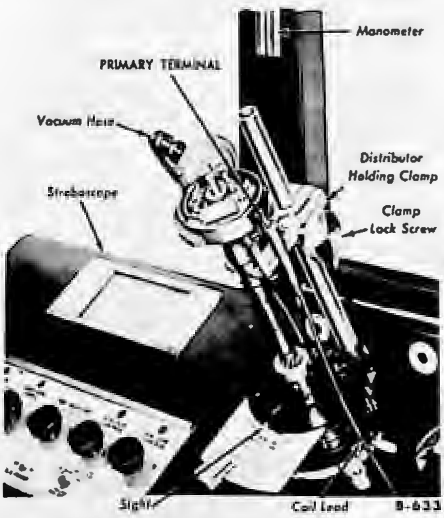

Figure 12—Checking Spark Advance on Stroboscope

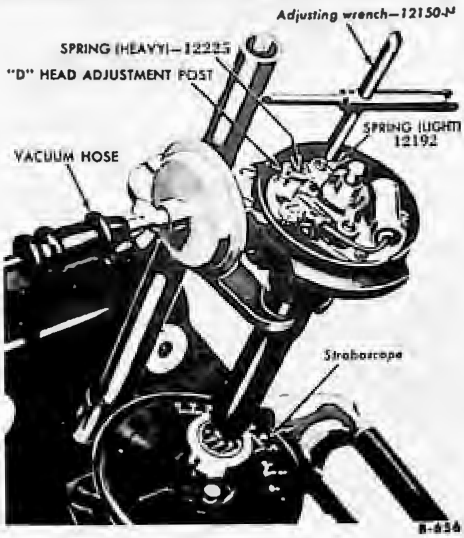

Figure 13—Adjusting Spark Advance Return Spring Tension, R Series Distributor

retard position, and rotate the distributor housing until the spark lines up with the zero degree position on the scale. Tighten the distributor holding clamp.

Check the distributor under the conditions given in the specifications. Set the distributor speed to the proper r.p.m. and apply the required vacuum. Read the spark advance on the degree scale. If the spark advance is not within these specifications, adjust the tension on the return springs, following the procedure under subparagraph b. below.

b. Vacuum Advance Adjustment.

Install the distributor on a suitable distributor stroboscope, and adjust the breaker contact spacing and spring tension if required.

Set the distributor speed at 200 r.p.m., hold the distributor breaker plate against the stops in full retard position, and rotate the distributor housing until the spark lines up with the zero degree position on the scale. Tighten the distributor holding clamp.

Release the tension on the two return (fig. 13) springs by turning both adjustment posts clockwise until the tension is relieved from each spring.

NOTE: ***On the 8-cylinder engine distributor, be sure the heavy spring is not in the compressed position when the breaker plate is fully retarded.***

Adjust the primary (light) spring first and the secondary (heavy) spring last (fig. 13). The procedure for making these adjustments is given below.

(1) *PRIMARY (LIGHT) SPRING ADJUSTMENT.*

Procedure	Distributor Series			
	H	R	MB	EQ
Set distributor speed to	400	400	400	400
Apply Vacuum (inches Hg) to distributor diaphragm	0.26	0.28	0.3	0.25
Turn adjustment post in clockwise direction until spark is advanced to (degrees)	1¾	1	1½	2¾

(2) *SECONDARY (HEAVY) SPRING ADJUSTMENT.*

Procedure	Distributor Series			
	H	R	MB	EQ
Set distributor speed to	1000	1200	1000	1000
Apply Vacuum (inches Hg) to distributor diaphragm	1.4	2.1	1.3	1.3
Turn adjustment post in clockwise direction until spark is advanced to (degrees)	6¼	6	6¾	7¾

(3) To check the accuracy of the adjustments, operate the distributor under the conditions specified in the Service Bulletin Subject No. 12000, Page 2.

If the spark advance is not within specifications under low vacuum, the light spring is at fault. If the spark advance is not within specifications under high vacuum, the heavy spring is at fault.

If it is impossible to adjust both springs to give the correct spark advance, one or both springs should be replaced, and the spark advance readjusted.

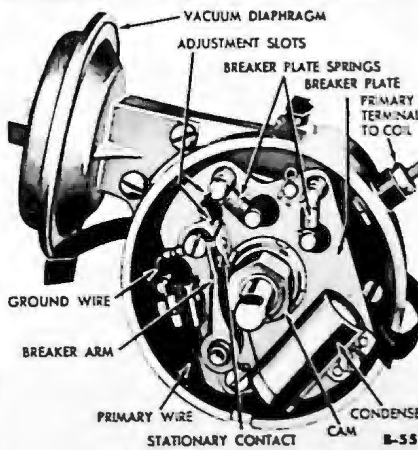

Figure 14—7HA Distributor

4. DISTRIBUTOR INSTALLATION

Remove the spark plug from No. 1 cylinder. Install a compression gauge in No. 1 spark plug hole.

NOTE: ***If compression gauge is not available, block the spark plug hole with you thumb. Compression will be high on compression stroke.***

Turn the engine slowly until No. 1 cylinder is moving up on the compression stroke. With No. 1 cylinder coming up on the compression stroke, turn the engine until the timing mark is in line with the pointer, and install the distributor in the engine with the rotor in No. 1 firing position. Time the ignition as outlined in paragraph 5 below.

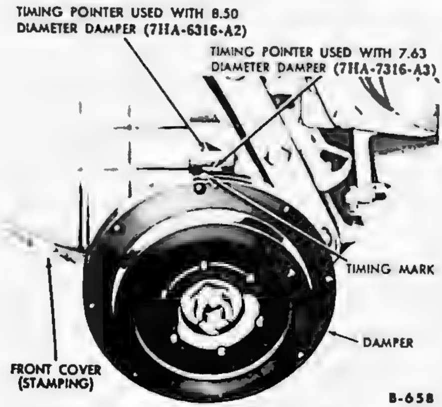

Figure 15—Timing Mark, 6-Cylinder Engine with Stamped Front-End Plate

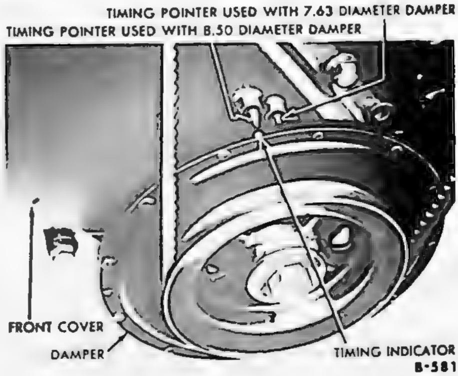

Figure 17—Timing Mark, 6-Cylinder Engine with Die-Cast Front End Plate

5. TIMING

A timing mark is on the damper on all engines except the R Series which carries the timing mark on the crankshaft pulley flange and the MB Series which carries the timing mark on the flywheel.

The H Series engine is equipped with either a viscous type damper having a groove timing mark or a rubber type damper having a ball timing mark. Because of the difference in diameter between the two types of dampers, two timing pointers are located on the front engine cover (figs. 15 and 17). The pointer nearest to the outer circumference of the damper should be used to time the engine.

The 8-cylinder engines incorporate a single timing pointer on the front engine cover (fig. 16).

Figure 16—8-Cylinder Engine Timing Mark

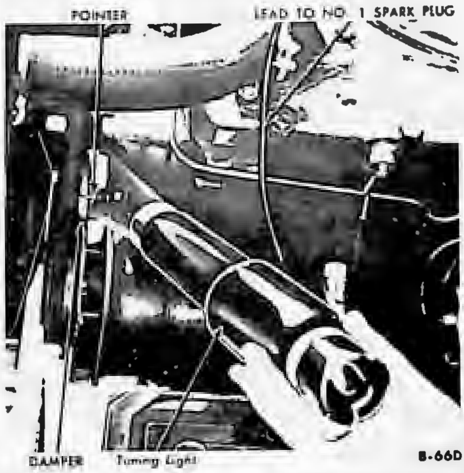

Figure 18—Checking Timing with Timing Light

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When the pointer and timing mark are in line, No. 1 or No. 6 cylinder is in the firing position on the 6- and 8-cylinder engines, depending on which piston is on the compression stroke.

When timing the distributor to the engine, set the timing mark in line with the pointer, and be sure that No. 1 piston is on the compression stroke as described under paragraph 4 above. Mark the distributor housing to indicate the position of the rotor when it is in line with the distributor cap No. 1 spark plug wire terminal.

With the timing mark in the correct position, the breaker contacts should just start to open when the rotor is in line with the mark previously made on the distributor housing.

If the rotor is not in the proper position, loosen the distributor housing holding screw, or V-clamp holding screw, and rotate the distributor until the contacts just open as the rotor approaches the position to fire No. 1 cylinder.

NOTE: *The ignition timing can be checked, while the engine is in operation, with the aid of a timing light. Be sure to disconnect the vacuum line to eliminate the possibility of any vacuum advance.*

Connect the timing light on the engine with the high tension lead on No. 1 spark plug and the other two leads to the proper battery terminals. Clean the grease and dirt from the timing mark and, if necessary, cover the timing mark and pointer with white chalk. Start the engine and operate it at idle speed. Direct the light on the timing mark as shown in figure 18. It should flash just as the timing mark lines up with the pointer, indicating correct timing. The operator should stand so that his eye is in line with the center of the damper or pulley and the timing pointer.

If the timing mark and the pointer do not line up, rotate the distributor until the timing mark is in line with the stationary pointer.

To advance the timing, rotate the distributor body counterclockwise and to retard the timing, rotate the distributor body clockwise.

6. CONTACT REPLACEMENT AND ADJUSTMENT

The distributor contact assembly (fig. 14) can be replaced without removing the distributor from the engine.

a. Removal.

Remove the two screws which secure the contact assembly to the breaker plate. Disconnect the primary and condenser leads from the contact assembly primary terminal, and remove the contact assembly.

b. Installation.

Place the primary and condenser leads, lock washers, and nut on the contact assembly primary terminal, and tighten the nut secuurely. Position the contact assembly on the breaker plate, and install the two holding screws. Be sure the ground wire terminal is on the screw nearest to the adjustment slot and the lock washer is used under the screw at the opposite end.

c. Breaker Contact Spacing Adjustment.

Remove the distributor cap and examine the distributor contacts. Replace contacts that are oily, severely pitted, badly oxidized, or have an excessive amount of foreign matter near the contact surfaces.

If the contacts are replaced or need adjustment, crank the engine until the rubbing block rests on the peak of a cam lobe. Loosen the contact lock screws, and insert a screw driver blade or adjusting blade of distributor adjusting wrench, tool No. 12150-N (fig. 19), in adjustment slot, and turn it to obtain the proper spacing given in Service Bulletin Specification No. 12000, Page 1.

NOTE: *When checking contact dwell with the distributor installed on a test set, be sure to use an external ground wire between the breaker plate and the test set on all distributors having black-coated housings. This is very important for accurate results.*

Tighten the two screws and recheck air gap. Install the distributor cap and rotor, and start the engine. Check the per cent dwell. Reset the contact spacing if necessary, to obtain the correct dwell. Alway:

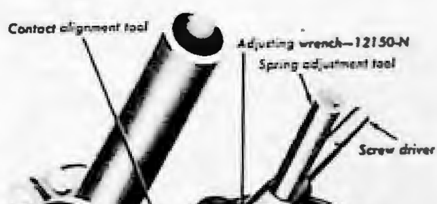


Figure 19—Adjusting Breaker Contact Spacing

retime the ignition (par. 5) after adjusting the breaker contact gap.

d. Breaker Contact Arm Spring Checking and adjustment.

Although the breaker contact assembly spring tension is set by the manufacturer, the tension should be adjusted if it is not within the recommended specifications.

(1) *CHECKING TENSION.* Place the tension gauge (fig. 20) as near to the breaker contact as possible and push at right angle (90°) until the contacts just open. Read the spring tension and adjust if outside specifications.

(2) *ADJUSTMENT.* Disconnect the wires at the contact primary terminal, and loosen the nut holding the spring in position. Move the spring toward the screw stud to increase the tension and in the opposite direction to decrease the tension. Tighten the nut securely and recheck the spring tension. After the proper tension is obtained, install the primary wires on the contact assembly primary terminal and securely tighten the nut.

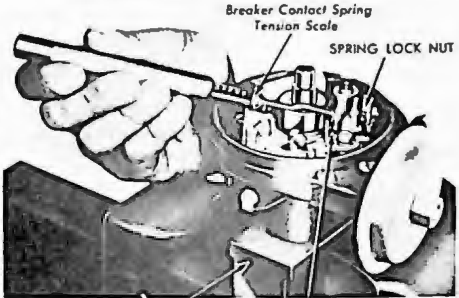


Figure 20—Checking Breaker Arm Spring Tension

7. DISTRIBUTOR LUBRICATION

An oiler on the distributor body below the distributor head is provided for the lubrication of the distributor drive shaft. Lubricate with two or three drops of engine oil at 1000-mile intervals.

The wear on the distributor rubbing block can be reduced by the application of a light film of the Ford distributor grease M-4601 on the distributor cam when contacts are serviced.

CAUTION: *Do not allow any lubricant to reach the contacts, as it will result in rapid burning of the contacts.*

8. SPARK PLUGS

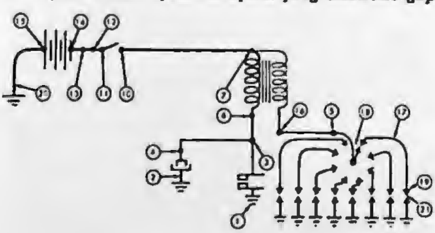
For best engine performance and economy, the spark plugs should be kept clean.

Use a sandblast cleaner to remove all of the carbon and lead deposit from the inside of the plugs. After cleaning the insulator, steel shell and electrodes should be free of discoloration. In addition to cleaning the electrodes, the upper porcelains should also be wiped clean. Adjust the spark plug electrode gap to the recommended spacing given in the Service Bulletin No. 12000, Page 4.

Be sure to make all adjustments by bending the side electrode. If the center electrode were bent, the insulator would crack.

Always test the plugs with a reliable tester and replace plugs if faulty.

When installing plugs, tighten to the required torque as given in Service Bulletin No. 12000, Page 4.



B-192

Figure 21—V-8 Ignition Circuit Diagram, Single Contact

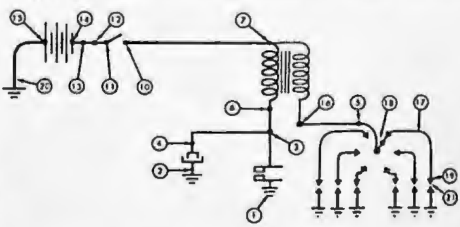


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Figure 22—6-Cylinder H Series Ignition Circuit Diagram

October 28, 1948

4 CYL. IGNITION TESTS

OPR. 12000-A

TEST 4 CYL. IGNITION (ON THE CAR)

This operation merely is a test procedure and not a correction. Where the car fails to meet the standards outlined here correction should be made.

1 **Wipe** off the **spark plug porcelains.**

2 If you have just completed opr. 10505-A proceed with paragraph 12 otherwise proceed as follows; **Set BRS plate area selector** to area of battery being tested. (3050 for 1940-41 cars see specifications section for other batteries.)

3 **Plug meter in BRS** attachment.

4 **Install BRS leads on battery terminals** (it is not necessary to remove cables).

5 **Adjust load rheostat so meter reads 100% on scale "M",** then **press** BRS **test button and** again **read on scale "M"** of meter. Reading will indicate condition of the battery. If reading is **below 70%** see **Opr. 10655-A.**

Back off load rheostat.

6 **Start engine and set speed at approximately 1250 r.p.m.**

7 **Turn on head light country beam.**

8 **Remove BRS leads from the battery.**

9 **Plug meter in 3 volt socket.**

10 **Contact positive battery post with negative low tension lead.**

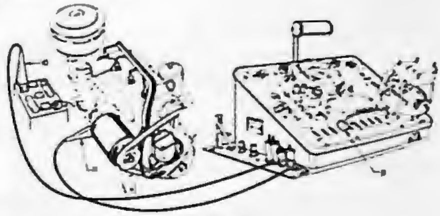


Fig. 2

11 **Contact generator** ground brush or the generator **case with positive low tension lead.**

Reading should be less than .1 (1/10) volt. (less than 4 on "B" scale). Otherwise excessive resistance exists in the ground circuit.

Turn headlights off.

12 **Plug meter in % of dwell socket.**

13 Connect **positive low tension** lead **to positive post of** the **battery.**

14 Connect the **negative low tension** lead **to the negative post** of the battery.

15 **Adjust % of dwell** rheostat **to read zero on scale "R".**

16 **Disconnect** the wire **from** the **input** terminal of the coil. Connect the **negative low tension lead to this wire.**

17 Connect the **positive low tension** lead **to the input terminal** of the **coil.**

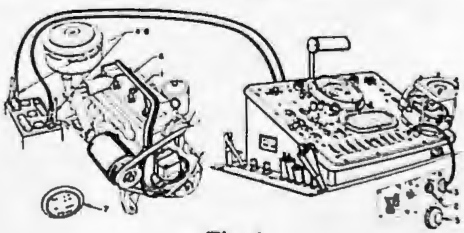


Fig. 1

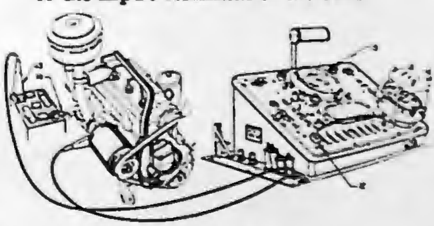


Fig. 3

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-BRS ATTACHMENT

ABOVE APPLIES TO MODELS:
ALL 4 CYL.

Printed in U.S.A.

May 1, 1941

SERVICE (Ford) BULLETIN

SUBJECT NO. 12000 PAGE NO. 26

18 Turn **ignition** switch **on.**

19 **If no reading** is now obtained turn the crankshaft slightly to **close** the breaker **points.**

20 **Reading** on scale "R" will be the resistance of the entire primary circuit in ohms. This **should be between 1.00 and 1.35 ohms.**

21 **Adjust** % of **dwell** rheostat **to** obtain reading of exactly **100%** on scale "B".

22 If the **battery in** the **car is** so **low** in charge that it is impossible to obtain 100% reading connect the negative high tension lead to the positive post of the battery and the negative interrupter lead to the negative post of the battery. This will place the test set battery in parallel to the battery in the car and should enable this setting to be made (recommend battery in the car be charged).

23 Start the **engine** and run **at idle** speed. **Reading** on all 4 cylinder distributors **should be between 31% and 43%** dwell at idle speeds.

24 **High readings** indicate breaker point **gap is too small.**

25 **Low readings** indicate that **gap** is either **too large or** the points are **low** in **conductivity.**

26 **Speed** the engine momentarily to **high speed and observe dwell** at high speed.

27 **Reading** should **not** drop **below 11** on the "B" scale.

28 **Lower readings** indicate **low** breaker arm **spring tension or friction at** the breaker arm **bearing.**

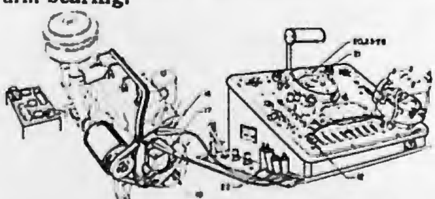


Fig. 4

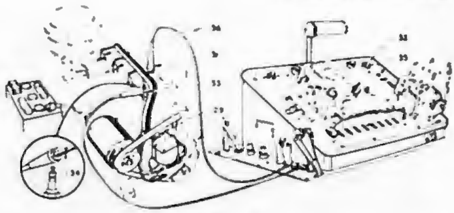


Fig. 5

29 **Reconnect wire** that was removed **from** the input terminal of the **coil.**

30 Again start the **engine** and allow it to run **at idle speed.**

31 **Ground** the **negative high tension** lead **to** the **engine.**

32 Set the spark **gap selector at 100 lbs.**

33 Clip the **positive high tension** lead **to** the **end of number 1 spark plug wire** while it is still on the plug.

34 **Lift** the **spark plug wire from** the spark **plug.**

35 **Spark should jump** the visible **gap** in the test set **regularly** without missing.

36 **Repeat** the above test **from all spark plug wires.**

37 Set the **spark gap** selector **at "SP"** position.

38 Connect the **positive high tension** lead **to spark plug terminals** (wires in place).

39 **If** the **spark jumps** the **visible gap** the **resistance** of the spark plug is **too high.** (Recommend sand blast cleaning and re-spacing.)

40 **Repeat** the above test **on all** spark **plugs.**

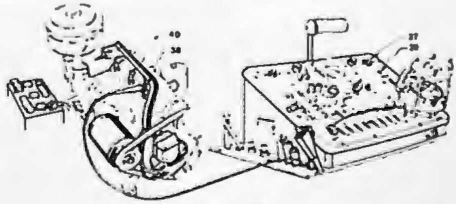


Fig. 6

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 4 CYL.	HEYER-HI-FORD LABORATORY TEST SET HEYER-HI-BRS ATTACHMENT

May 1, 1941

Printed in U.S.A.

4 cyl. Ignition Tests (cont.)
OPR. 12000-B

TEST AND ADJUST 4 CYL. DISTRIBUTER AND COIL

1 Set stroboscope disc at 90 degrees.

2 Set timing index (on base of stroboscope bakelite housing) at TDC (see Fig. 1).

3 Test set battery must be 6 volts minimum (this is important).

4 Plug adapter in % of dwell socket.

5 Open test set interrupter points. (This is accomplished by pulling out the small handle at base of stroboscope) (see Fig. 1).

6 Examine breaker points. Replace points if burned or pitted.

7 Install 4 cyl. adapter on the stroboscope then install the distributor on the adapter with contactor taking the place of the coil (see insert Fig. 2).

8 Connect the negative interrupter lead to the negative low tension lead.

9 Plug meter on adapter in % of dwell socket (Fig. 1).

10 Ground positive low tension lead to distributor case.

11 Adjust dwell rheostat to obtain reading of zero ohms on scale "R".

12 Connect positive low tension lead to adapter contactor.

13 Turn distributor shaft until points are closed and read contact resistance of the points on scale "R". If resistance exceeds .1 (1/10) ohm replace points.

14 Plug meter in M.P.H. socket.

15 Set speed (left hand rotation) at 500 R.P.M. on scale "S" (maintain this speed).

16 Plug meter on adapter in % of dwell socket (see Fig. 3).

17 Ground positive low tension lead to distributor case (Fig. 4).

18 Adjust reading to exactly 100% with dwell rheostat (with stroboscope running at 500 R.P.M.) (Fig. 3).

19 Connect positive low tension lead to adaptor contactor (Fig. 3).

20 Adjust points to obtain reading of 41%.

21 Plug meter in M.P.H. socket and set speed at 2000 R.P.M. then plug the meter on top of the adapter in % of dwell socket and observed well at this speed (Fig. 3).

Dwell at 2000 R.P.M. should be between 36% and 41%.

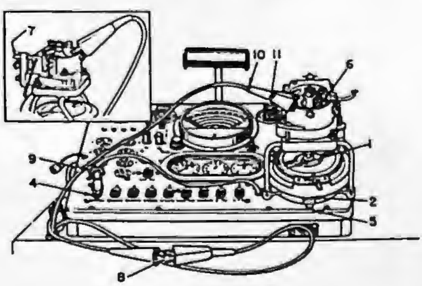


Fig. 1

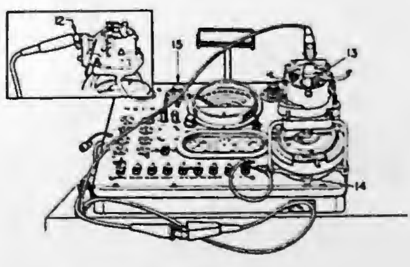


Fig. 2

EQUIPMENT USED
HEYER—EGDAE—STROBOSCOPE ADAPTER HEYER—HI-DFZ—STROBOSCOPE HEYER—HI-FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:
ALL 4 CYLINDERS

May 1, 1941

22 If the reading falls below these limits breaker arm spring tension is weak or breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.

23 Stop stroboscope and install coil on distributor. (It is necessary to put contactor to side in order to put the coil on.)

24 Connect positive low tension lead to distributor case.

25 Adjust % of dwell rheostat to obtain reading of zero ohms on scale "R".

26 Plug the "DABOM" lead into the stroboscope base and attach other (clip) end to coil high tension terminal. (Remove rotor.)

27 Connect the positive low tension lead to input terminal of the coil.

28 If no reading is obtained turn the distributor shaft until the points are closed.

29 If with the points closed no reading is obtained continuity of the coil primary is broken.

30 Reading on scale "R" indicates the resistance of the coil primary and the points in ohms.

31 Set peep sight at zero spark advance.

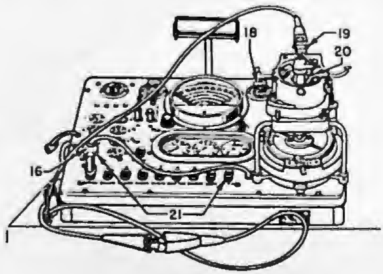


Fig. 3

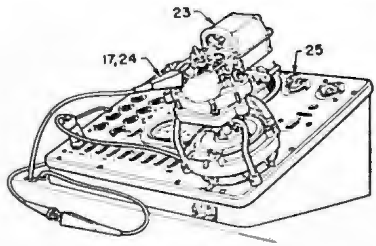


Fig. 4

32 Plug meter in M. P. H. socket and set speed below 200 R.P.M. (Fig. 6).

33 Adjust the timing of the distributor so that the timing light through the small round hole in the stroboscope disc is in line with the peep sight.

34 Set stroboscope at 400 R.P.M. (Fig. 6).

35 Set peep sight in line with timing light (Fig. 6).

36 Spark advance at 400 R.P.M. should be between 3 and 4 degrees.

37 Set speed at 800 R.P.M. (Fig. 6).

38 Again set peep sight in line with timing light (Fig. 6).

(Continued on page 31)

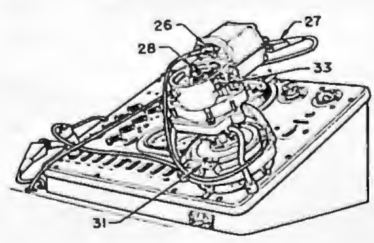


Fig. 5

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 4 CYLINDERS	HEYER—EGDAE—STROBOSCOPE ADAPTER HEYER—HI-DFZ—STROBOSCOPE HEYER—HI-FORD LABORATORY TEST SET

4 cyl. Ignition Tests (cont.)

(Continued from page 30)

39 Spark **advance** at this speed **should be between 8½ and 9½ degrees.**

40 **Observe** the four bright lines of the stroboscopic **image at various speeds.**

41 **If** the bright **lines have a jog** in them greater than the width of the line the cam is worn or the distributor shaft is bent and should be replaced. (Width of the line represents one degree of error.)

42 Momentarily run the stroboscope at **high speed. If** the bright **lines** appear to **dance** this indicates that the points are bouncing or are not closing uniformly.

If the speed at which this occurs is within the range of operation of the car, trouble will be experienced on the road at the R.P.M. indicated on the meter. **Stop stroboscope.**

43 Remove "DABOM" **adapter lead** from stroboscope base (leave connected to the coil) and connect **prong to positive high tension lead.**

44 **Disconnect negative interrupter** lead **from negative low tension** lead.

45 **Disconnect positive low tension** lead and **connect negative interrupter** lead **to rear terminal of the coil.**

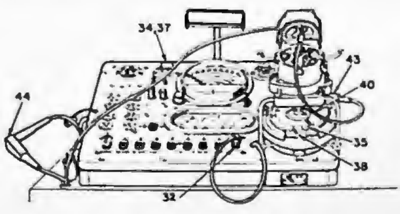


Fig. 6

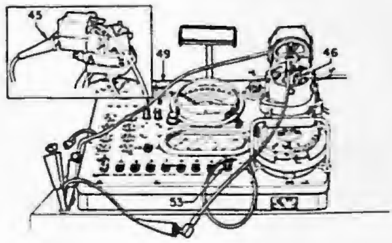


Fig. 7

46 The **points must be closed** to complete the primary circuit.

47 Allow the coil to **set** for **5 minutes** thus connected **to warm the coil.**

48 Set the **spark gap selector at 100** lbs. compression.

49 Set the **speed at 500 R.P.M.**

50 Plug **meter into milliamp** socket.

51 Any reading **above ½ milliamp** is **satisfactory** for this speed.

52 **Set spark gap** selector **at 60 lbs.** compression.

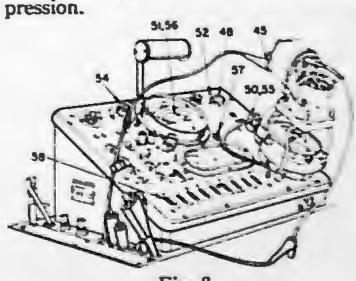


Fig. 8

EQUIPMENT USED
HEYER—EGDAE—STROBOSCOPE ADAPTER HEYER—HI-DFZ—STROBOSCOPE HEYER—HI-FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:

ALL 4 CYLINDERS

Printed in U.S.A.

May 1, 1941

53 Plug the meter into the M.P.H. socket (Fig. 7).

54 Set stroboscope speed at 2000 R.P.M.

55 Plug meter in milliamp socket (Fig. 8).

56 Reading should be above ½ milliamp if not coil is apt to miss at high speeds.

57 Stop stroboscope (Fig. 8).

58 Remove the adapter from the % of dwell socket when finished otherwise you may damage the test set on other tests (Fig. 8).

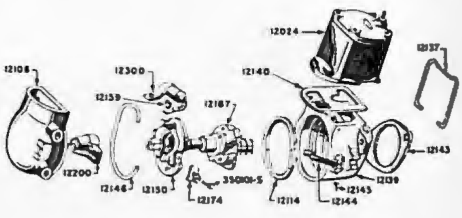


Fig. 9

The mere purchasing of service equipment is useless if your service department does not use it. Every member of your service organization should be familiar with and understand the use of each piece of equipment you have. Being familiar with this equipment they will use it. This will assure better work performed in less time.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 4 CYLINDERS	HEYER—EGDAE—STROBOSCOPE ADAPTER HEYER—HI-DFZ—STROBOSCOPE HEYER—HI-FORD LABORATORY TEST SET

May 1, 1941

Printed in U.S.A.

6 Cyl. Ignition Tests

OPR. 12000-A

TEST 6 CYL. IGNITION (ON THE CAR)

This operation merely is a test procedure and not a correction. Where the car fails to meet the standards outlined here correction should be made.

1 **Wipe off the spark plug porcelains.**

2 If you have just completed opr. 10505-A proceed with paragraph 12 otherwise proceed as follows; **Set BRS plate area selector** to area of battery being tested. (3050 for 1941 cars see specifications section for other batteries.)

3 **Plug meter in BRS** attachment.

4 **Install BRS leads on battery terminals** (it is not necessary to remove cables).

5 **Adjust load rheostat so meter reads 100% on scale "M", then press** BRS **test button and** again **read on scale "M"** of meter. Reading will indicate condition of the battery. **If** reading is **below 70%** see **Opr. 10655-A.**

Back off load rheostat.

6 **Start engine and set speed at approximately 1250 r.p.m.**

7 **Turn on head light country beam.**

8 **Remove BRS leads from the battery.**

9 **Plug meter in 3 volt socket.**

10 **Contact positive battery post with negative low tension lead.**

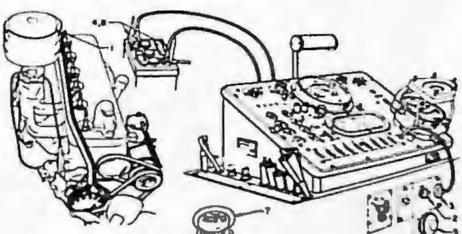


Fig. 1

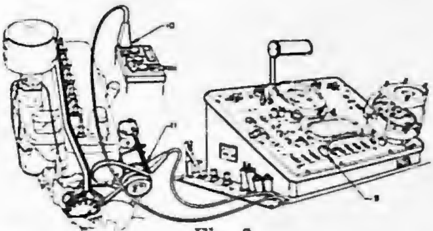


Fig. 2

11 **Contact generator** ground brush or the generator **case with positive low tension lead.**

Reading should be less than .1 (1/10) volt. (less than 4 on "B" scale). Otherwise excessive resistance exists in the ground circuit.

Turn headlights off.

12 **Plug meter in** % of **dwell socket.**

13 Connect **positive low tension** lead **to positive post of the battery.**

14 Connect the **negative low tension** lead **to the negative post** of the battery.

15 **Adjust** % **of dwell** rheostat to read **zero on scale "R".**

16 **Disconnect** the low tension **wire** that runs **from** the **distributor to** the **coil** at the coil. Connect the **positive low** tension lead **to this wire.** (Fig. 4)

17 Connect the **negative low tension** lead **to** the **coil terminal** from which wire was removed. (Fig. 4)

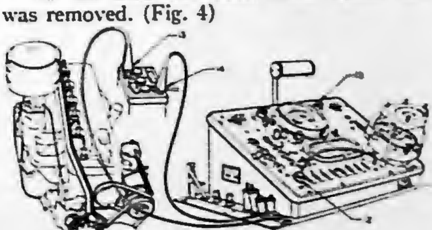


Fig. 3

EQUIPMENT USED
HEYER—H1-FORD LABORATORY TEST SET
HEYER—H1-BRS ATTACHMENT

ABOVE APPLIES TO MODELS:

ALL 6 CYL.

May 29, 1941

SERVICE BULLETIN

SUBJECT NO. 12000 PAGE NO. 46

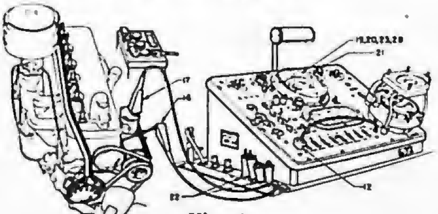


Fig. 4

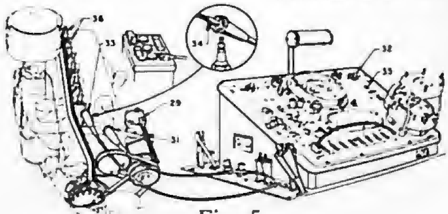


Fig. 5

18 Turn **ignition** switch **on.**

19 **If no reading** is now obtained turn the crankshaft slightly to **close** the breaker **points.**

20 **Reading** on scale "R" will be the resistance of the entire primary circuit in ohms. This **should be between 1.00 and 1.35 ohms.**

21 **Adjust % of dwell** rheostat **to** obtain reading of exactly **100%** on scale "B"

22 **If** the **battery in** the **car is** so **low** in charge that it is impossible to obtain 100% reading connect the negative high tension lead to the positive post of the battery and the negative interrupter lead to the negative post of the battery. This will place the test set battery in parallel to the battery in the car and should enable this setting to be made (recommend battery in the car be charged).

23 Start the **engine** and run **at idle** speed. **Reading** on all 6 cyl. distributors **should be between 65% and 67%** dwell at idle speeds.

24 **High readings** indicate breaker point **gap is too small.**

25 **Low readings** indicate that **gap** is either **too large or** the points are **low** in **conductivity.**

26 Speed the engine momentarily to **high speed and observe dwell** at high speed.

27 **Reading** should **not** drop **below** 63 on the "B" scale.

28 **Lower readings** indicate **low** breaker arm **spring tension or friction at** the breaker arm **bearing.**

29 **Reconnect wire** that was removed **from** the terminal of the **coil.**

30 Again start the **engine** and allow it to run **at idle speed.**

31 **Ground** the **negative high tension** lead **to** the **engine.**

32 Set the spark **gap selector at 120 lbs.**

33 Clip the **positive high tension** lead **to** the **end of number 1 spark plug wire** while it is still on the plug.

34 **Lift** the **spark plug wire from** the spark **plug.**

35 **Spark should jump** the visible **gap** in the test set **regularly** without missing.

36 **Repeat** the above test **from all spark plug wires.**

37 Set the **spark gap** selector **at "SP"** position.

38 Connect the **positive high tension** lead **to spark plug terminals** (wires in place).

39 **If** the **spark jumps** the **visible gap** the **resistance** of the spark plug is **too high.** (Recommend sand blast cleaning and re-spacing.)

40 **Repeat** the above test **on all spark plugs.**

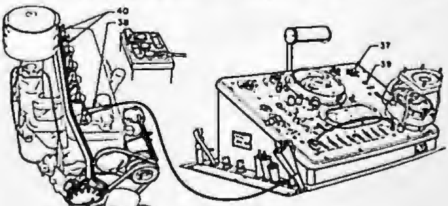


Fig. 6

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 6 CYL.	HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-BRS ATTACHMENT

May 20, 1941

Printed in U.S.A.

6 Cyl. Ignition Tests (Cont.)
OPR. 12000-B

TEST AND ADJUST 6 CYLINDER DISTRIBUTOR AND COIL

1 **Set** stroboscope **disc at 60 degrees.**

2 **Set timing index** (on base of stroboscope bakelite housing) **at one degree before top dead center.**

3 Test set **battery must be 6 volts** minimum. This is important.

4 Plug **adapter in** % of **dwell socket.**

5 **Open test set** interrupter **points.** (This is accomplished by pulling out the small handle at base of stroboscope.)

6 **Examine** breaker **points.** Replace points if burned or pitted.

7 **Loosen** the **vacuum brake** assy. in the distributor housing. However don't take it all the way out as it can be used to stabilize the stroboscope speeds in the lower speed ranges.

The vacuum brake should be loosened **before** the **distributor is mounted** on the stroboscope otherwise considerable strain is placed on the fixture.

8 **Install** the 4 cyl. and **6 cyl. adapter on** the **stroboscope then install** the **distributor** on the adapter.

9 Connect the **negative interrupter** lead **to the negative low tension** lead.

10 **Plug meter on adapter** in % of dwell socket.

11 Ground **positive low tension** lead **to distributor case.**

12 **Adjust** dwell rheostat **to obtain reading** of **zero ohms on scale "R".**

13 Connect **positive low tension** lead **to distributor primary terminal.**

14 Turn distributor shaft until points are closed and **read** contact resistance of points in **ohms on scale "R".** If resistance exceeds .1 (1/10) ohm replace points.

15 **Plug** meter **in M.P.H. socket.**

16 **Set** speed (left hand rotation) **at 500 R.P.M.** on scale "S" (maintain this speed).

17 **Plug meter on adapter** in % of dwell socket (Fig. 3).

18 Ground **positive low tension** lead **to distributor case** (Fig. 3).

19 **Adjust reading** to exactly **100%** with dwell rheostat (With stroboscope running at 500 R.P.M.) (Fig. 3).

20 Connect **positive low tension** lead **to distributor primary terminal** (Fig. 3).

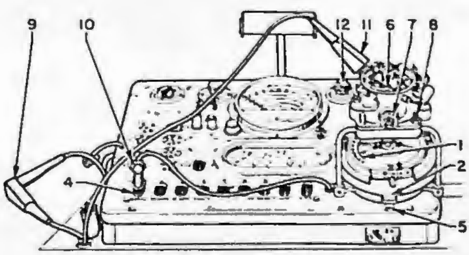


Fig. 1

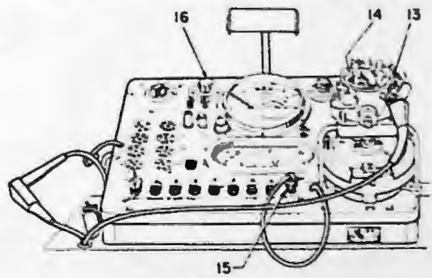


Fig. 2

EQUIPMENT USED

HEYER—EGDAF—STROBOSCOPE ADAPTER
HEYER—H1—FORD LABORATORY TEST SET
HEYER—H1—DFZ DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:

ALL 6 CYL.

SERVICE BULLETIN

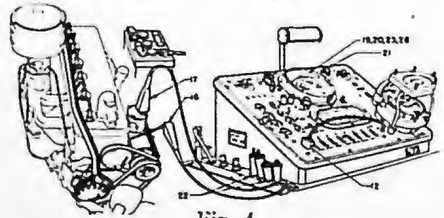


Fig. 4

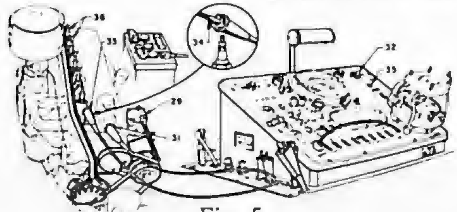


Fig. 5

18 Turn **ignition** switch **on.**

19 If **no reading** is now obtained turn the crankshaft slightly to **close** the breaker **points.**

20 **Reading** on scale "R" will be the resistance of the entire primary circuit in ohms. This **should be between 1.00 and 1.35 ohms.**

21 **Adjust % of dwell** rheostat **to** obtain reading of exactly **100%** on scale "B"

22 If the **battery in** the **car is** so **low** in charge that it is impossible to obtain 100% reading connect the negative high tension lead to the positive post of the battery and the negative interrupter lead to the negative post of the battery. This will place the test set battery in parallel to the battery in the car and should enable this setting to be made (recommend battery in the car be charged).

23 Start the **engine** and run **at idle** speed. **Reading** on all 6 cyl. distributors **should be between 65% and 67%** dwell at idle speeds.

24 **High readings** indicate breaker point **gap is too small.**

25 **Low readings** indicate that **gap** is either **too large or** the **points** are **low** in **conductivity.**

26 Speed the engine momentarily to **high speed and observe dwell** at high speed.

27 **Reading** should **not drop below** 63 on the "B" scale.

28 **Lower readings** indicate **low** breaker arm **spring tension or friction at** the breaker arm **bearing.**

29 **Reconnect wire** that was removed **from** the terminal of the **coil.**

30 Again start the **engine** and allow it to run **at idle speed.**

31 **Ground** the **negative high tension** lead to the **engine.**

32 Set the spark **gap selector at 120 lbs.**

33 Clip the **positive high tension** lead **to** the **end of number 1 spark plug wire** while it is still on the plug.

34 **Lift** the **spark plug wire from** the spark **plug.**

35 **Spark should jump** the visible **gap** in the test set **regularly** without missing.

36 **Repeat** the above test **from all spark plug wires.**

37 Set the **spark gap** selector **at "SP"** position.

38 Connect the **positive high tension** lead **to spark plug terminals** (wires in place).

39 **If** the **spark jumps** the **visible gap** the **resistance** of the spark plug is **too high.** (Recommend sand blast cleaning and re-spacing.)

40 **Repeat** the above test **on all** spark **plugs.**

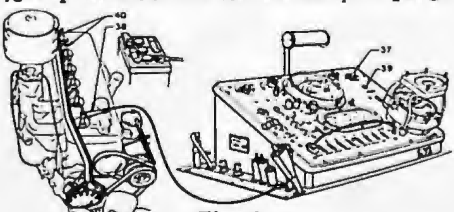


Fig. 6

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 6 CYL.	HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-BRS ATTACHMENT

6 Cyl. Ignition Tests (Cont.)
OPR. 12000-B

TEST AND ADJUST 6 CYLINDER DISTRIBUTOR AND COIL

1 **Set** stroboscope **disc at 60 degrees.**
2 **Set timing index** (on base of stroboscope bakelite housing) **at one degree before top dead center.**
3 Test set **battery must be 6 volts** minimum. This is important.
4 Plug **adapter in** % of **dwell socket.**
5 **Open test set** interrupter **points.** (This is accomplished by pulling out the small handle at base of stroboscope.)
6 **Examine** breaker **points.** Replace points if burned or pitted.
7 **Loosen** the **vacuum brake** assy. in the distributor housing. However don't take it all the way out as it can be used to stabilize the stroboscope speeds in the lower speed ranges.

The vacuum brake should be loosened **before the distributor is mounted** on the stroboscope otherwise considerable strain is placed on the fixture.

8 **Install** the 4 cyl. and **6 cyl. adapter on** the **stroboscope then install** the **distributor** on the adapter.
9 Connect the **negative interrupter** lead to the **negative low tension** lead.
10 **Plug meter on adapter** in % of dwell socket.
11 Ground **positive low tension** lead **to distributor case.**
12 **Adjust** dwell rheostat to obtain **reading** of **zero ohms on scale "R".**
13 Connect **positive low tension** lead **to distributor primary terminal.**
14 Turn distributor shaft until points are closed and **read** contact resistance of points in **ohms on scale "R".** If resistance exceeds .1 (1/10) ohm replace points.
15 **Plug** meter **in M.P.H. socket.**
16 **Set** speed (left hand rotation) **at 500 R.P.M.** on scale "S" (maintain this speed).
17 **Plug meter on adapter** in % of dwell socket (Fig. 3).
18 Ground **positive low tension** lead **to distributor case** (Fig. 3).
19 **Adjust reading** to exactly 100% with dwell rheostat (With stroboscope running at 500 R.P.M.) (Fig. 3).
20 Connect **positive low tension** lead **to distributor primary terminal** (Fig. 3).

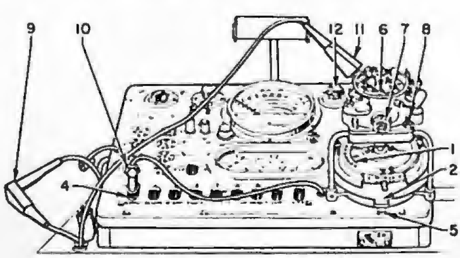


Fig. 1

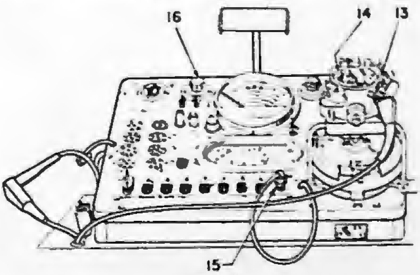


Fig. 2

EQUIPMENT USED
HEYER—EGDAF—STROBOSCOPE ADAPTER
HEYER—H1—FORD LABORATORY TEST SET
HEYER—H1—DFZ DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL 6 CYL.

May 20, 1941

SERVICE BULLETIN

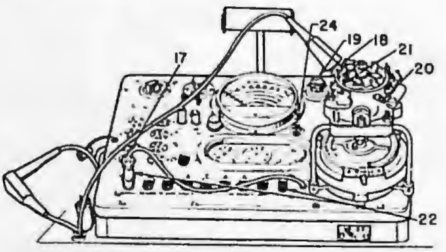


Fig 3

21 Adjust points to obtain reading of **67%.**

22 Plug meter **in M.P.H.** socket and set speed at **2000 R.P.M., then plug** the meter **on** top of the **adapter** in **%** of dwell socket and observe dwell at this speed.

Dwell at 2000 R.P.M. **should be between 62% and 67%.**

23 If the reading falls **below** these **limits** breaker arm spring tension is weak or breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.

24 Stop stroboscope.

25 Connect **positive low tension** lead **to distributor case.**

26 Adjust % of dwell rheostat **to** obtain reading of **zero ohms** (Scale "R").

27 Connect distributor primary terminal **to front** primary **terminal of the coil** (front terminal when coil is mounted on the

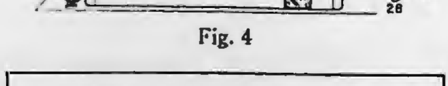


Fig. 4

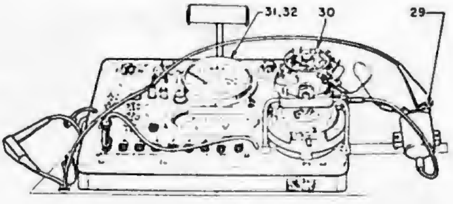


Fig. 5

engine) using short lead "DEBED" provided with the 6 cylinder stroboscope adapter.

28 Plug the "DEBEN" **lead into** the secondary **coil** terminal **socket. Plug** the **other** end of this lead **into** the **stroboscope base.**

29 Connect the **positive low tension** lead **to** the **rear** primary **terminal** of the **coil.**

30 If no reading is obtained turn the distributor shaft until the points are closed.

31 If with the **points closed no reading** is obtained continuity of the coil primary is broken.

32 Reading on scale "R" indicates the resistance of the **coil primary and the points in ohms.**

33 Plug meter **in M.P.H.** socket.

34 Set stroboscope **speed at 150 R.P.M.** this can be done easily by setting the speed at approximately 500 R.P.M. and slowing it down to 150 R.P.M. by screwing the vacuum brake in with the fingers. (These distributors

(Continued on page 51)

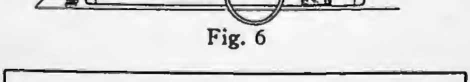


Fig. 6

ABOVE APPLIES TO MODELS:

ALL 6 CYL.

EQUIPMENT USED

HEYER—EGDAF—STROBOSCOPE ADAPTER
HEYER—H1—FORD LABORATORY TEST SET
HEYER—H1—DFZ DISTRIBUTOR STROBOSCOPE

May 20, 1941

Printed in U.S.A.

6 Cyl. Ignition Tests (Cont.)

(Continuing from page 50)

start to advance at 200 R.P.M. therefore it is necessary to set the timing at some point below this speed.)

35 Set **peep sight at zero** spark advance.

36 **Adjust** the **timing** of the distributor so that the timing light through the small round hole in the stroboscope disc is in line with the peep sight (Fig. 6).

37 **Remove** the **vacuum brake and set** stroboscope **at 600 R.P.M.**

38 **Speed** given above **represents** the speed at which **maximum advance** is reached (vacuum brake must have been removed).

39 **Set peep sight** in line **with** the **timing light.**

40 **Spark advance** at this speed **should be between 11 and 12 degrees.**

41 **Observe** the six bright lines of the stroboscopic **image at various speeds.**

42 **If** the bright **lines have a jog** in them greater than the width of the line the cam is worn or the distributor shaft is bent and should be replaced. (width of the line represents one degree of error)

43 Momentarily run the stroboscope at **high speed. If** the bright **lines** appear to **dance** this indicates that the points are bouncing or are not closing uniformly.

If the speed at which this occurs is within the range of operation of the car, trouble will be experienced on the road at the R.P.M. indicated on the meter. **Stop stroboscope.**

44 Remove "DEBEN" **adapter lead** from stroboscope base (leave connected to the coil) and connect **prong to positive high tension lead.**

45 **Disconnect negative interrupter** lead **from negative low tension** lead.

46 **Disconnect positive low tension** lead and **connect negative interrupter** lead **to rear terminal** of the **coil.**

47 The **points must be closed** to complete the primary circuit.

48 Allow the coil to **set** for **5 minutes** thus connected **to warm** the **coil.**

49 Set the **spark gap selector at 120** lbs. compression (Fig. 9).

50 Set the **speed at 500 R.P.M.** (Fig. 9).

51 Plug **meter into milliamp** socket.

52 Any reading **above ½ milliamp** is **satisfactory** for this speed (Fig. 9).

53 **Set spark gap** selector **at 60 lbs.** compression (Fig. 9).

54 Plug the **meter into** the **M.P.H.** socket.

55 **Set** stroboscope speed **at 2250 R.P.M.**

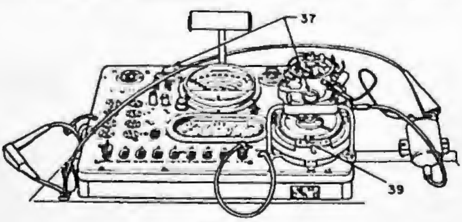


Fig. 7

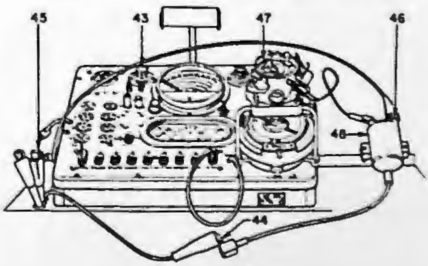


Fig. 8

EQUIPMENT USED
HEYER—EGDAF—STROBOSCOPE ADAPTER HEYER—H1—FORD LABORATORY TEST SET HEYER—H1—DFZ DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL 6 CYL.

Printed in U.S.A.

May 20, 1941

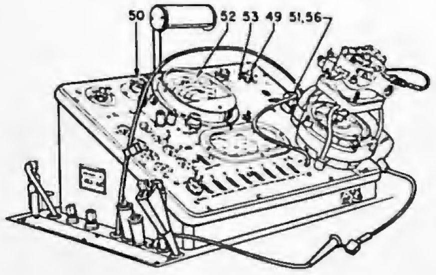


Fig. 9

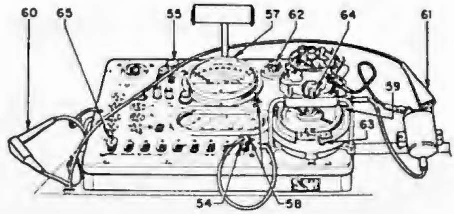


Fig. 10

56 Plug **meter in milliamp socket.**

57 Reading **should be above ½ milliamp** if not coil is apt to miss at high speeds.

58 **Stop stroboscope** and plug **meter in** M.P.H. socket.

59 **Disconnect** the **positive high tension** lead from the "DEBEN" adapter lead and **plug** the prong of the **adapter lead into** the **stroboscope base.**

60 Connect **negative interrupter** lead **to negative** low **tension** lead.

61 Connect **positive low tension** lead **to rear** primary **terminal** of the **coil** and **start stroboscope.**

62 **Adjust** % of **dwell rheostat to sharpen** timing **light** if required.

63 **Set peep sight at 2 degrees** advance.

64 **Install vacuum brake and adjust** to retard spark to the peep sight while the distributor is being driven at 650 R.P.M.

65 **Stop stroboscope** and **remove** the **adapter** from the % of dwell socket **when finished** otherwise you may damage the test set on other tests.

Many successful dealers capture the night trade by arranging a scheme of shift-work whereby at least one responsible mechanic is always available.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL 6 CYL.	HEYER—EGDAF—STROBOSCOPE ADAPTER HEYER—H1—FORD LABORATORY TEST SET HEYER—H1—DFZ DISTRIBUTOR STROBOSCOPE

May 20, 1941

Printed in U.S.A.

V-8 IGNITION TESTS
OPR. 12000-A

TEST V-8 IGNITION (ON THE CAR)

This operation merely is a test procedure and not a correction. Where the car fails to meet the standards outlined here correction should be made.

1 **Wipe off the spark plug porcelains.**

2 If you have just completed opr. 10505-A proceed with paragraph 12 otherwise proceed as follows; **Set BRS plate area selector** to area of battery being tested. (3050 for 1940-41 cars see specifications section for other batteries.)

3 **Plug meter in BRS** attachment.

4 **Install BRS leads on battery terminals** (it is not necessary to remove cables).

5 **Adjust load rheostat so meter reads 100% on scale "M",** then **press** BRS **test button and** again **read on scale "M"** of meter. Reading will indicate condition of the battery. If reading is **below 70%** see. **Opr. 10655-A.**

Back off load rheostat.

6 **Start engine and set speed at approximately 1250 r.p.m.**

7 **Turn on head light country beam.**

8 **Remove BRS leads from the battery.**

9 **Plug meter in 3 volt socket.**

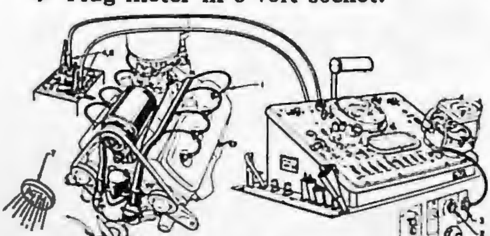


Fig. 1

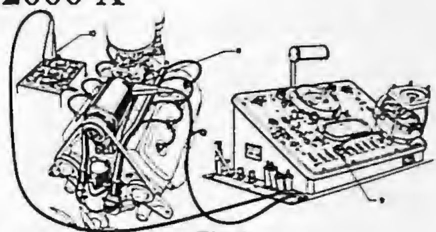


Fig. 2

10 **Contact positive battery post with negative low tension lead.**

11 **Contact generator** ground brush or the generator **case with positive low tension lead.**

Reading should be less than .1 (1/10) volt. (less than 4 on "B" scale). Otherwise excessive resistance exists in the ground circuit.

Turn headlights off.

12 **Plug meter in** % of **dwell socket.**

13 Connect **positive low tension** lead **to positive post of the battery.**

14 Connect the **negative low tension** lead **to the negative post** of the battery.

15 **Adjust** % of **dwell** rheostat **to** read **zero on scale "R".**

16 **Disconnect** the **wire from** the input terminal of the **coil.** Connect the **negative low tension lead to this wire.**

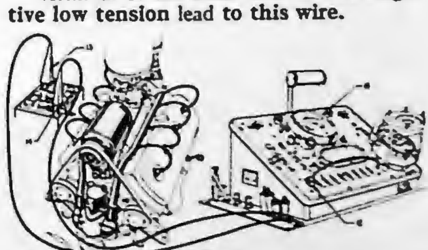


Fig. 3

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-BRS ATTACHMENT

ABOVE APPLIES TO MODELS:

ALL V-8

May 1, 1941

17 Connect the positive low tension lead to the input terminal of the coil.

18 Turn ignition switch on.

19 If no reading is now obtained turn the crankshaft slightly to close the breaker points.

20 Reading on scale "R" will be the resistance of the entire primary circuit in ohms. This should be between 1.00 and 1.35 ohms.

21 Adjust % of dwell rheostat to obtain reading of exactly 100% on scale "B".

22 If the battery in the car is so low in charge that it is impossible to obtain 100% reading connect the negative high tension lead to the positive post of the battery and the negative interrupter lead to the negative post of the battery. This will place the test set battery in parallel to the battery in the car and should enable this setting to be made (recommend battery in the car be charged).

23 Start the engine and run at idle speed. Reading on all V-8 distributors should be between 74% and 87% dwell at idle speeds.

24 High readings indicate breaker point gap is too small.

25 Low readings indicate that gap is either too large or the points are low in conductivity.

26 Speed the engine momentarily to high speed and observe dwell at high speed.

27 Reading should not drop below 21 on the "B" scale.

28 Lower readings indicate low breaker arm spring tension or friction at the breaker arm bearing.

Fig. 4

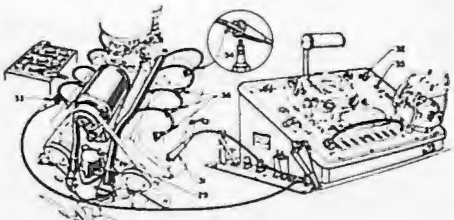


Fig. 5

29 Reconnect wire that was removed from the input terminal of the coil.

30 Again start the engine and allow it to run at idle speed.

31 Ground the negative high tension lead to the engine.

32 Set the spark gap selector at 120 lbs.

33 Clip the positive high tension lead to the end of number 1 spark plug wire while it is still on the plug.

34 Lift the spark plug wire from the spark plug.

35 Spark should jump the visible gap in the test set regularly without missing.

36 Repeat the above test from all spark plug wires.

37 Set the spark gap selector at "SP" position.

38 Connect the positive high tension lead to spark plug terminals (wires in place).

39 If the spark jumps the visible gap the resistance of the spark plug is too high. (Recommend sand blast cleaning and re-spacing.)

40 Repeat the above test on all spark plugs.

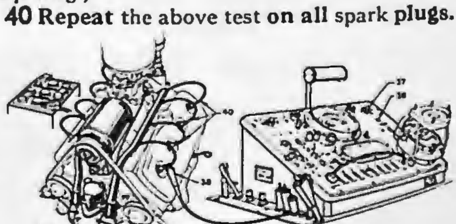


Fig. 6

ABOVE APPLIES TO MODELS:

ALL V-8

EQUIPMENT USED:

HEYER—H1-FORD LABORATORY TEST SET
HEYER—H1-BRS ATTACHMENT

May 1, 1941

Printed in U.S.A.

V-8 Ignition Tests (cont.)
OPR. 12000-B

TEST AND ADJUST V-8 DISTRIBUTOR AND COIL

1 **Set** stroboscope **disc at 45 degrees.**

2 **Set timing index** (on base of stroboscope bakelite housing) **at 2 degrees before top dead center.**

All V-8 distributors are set with basic timing of 2 degrees before top dead center.

3 Test set **battery must be 6 volts** minimum; this is important.

4 Plug **adapter in %** of **dwell socket.** (adapter must be removed when testing test set battery voltage).

5 **Open** the **test set** interrupter **points.** (this is accomplished by pulling out the small handle at base of stroboscope).

6 **Examine** breaker **points.** Replace points (or distributor) if burned or pitted.

7 **Loosen** the **vacuum brake** assy. in the distributor housing. However don't take it all the way out as it can be used to stabilize the stroboscope speeds in the lower speed ranges.

The vacuum brake should be loosened **before** the **distributor is mounted** on the stroboscope otherwise considerable strain is placed on the fixture.

8 **Install** the distributor **on** the **stroboscope.**

9 Connect **negative interrupter** lead **to negative low tension** lead.

10 Turn distributor shaft until **left hand points** are **closed.** (left or right is as viewed from the drivers seat not as viewed from the front of the test set).

11 **Insulate right hand points apart.** (thin strip of celluloid placed between the points is satisfactory).

12 **Plug meter on adapter** in % of dwell socket.

13 Ground **positive low tension** lead **to distributor** case.

14 **Adjust** dwell rheostat **to** obtain **reading of zero ohms on scale "R"**

15 Connect **positive low tension** lead **to condenser terminal.**

16 **Read** contact resistance of left hand points **in ohms on scale "R".** If resistance exceeds .1 (1/10) ohm replace points (or distributor).

17 Plug **meter in M.P.H. socket.**

18 **Set** speed (left hand rotation) **at 500 R.P.M.** (scale "S") (maintain this speed).

19 **Plug meter on adapter** in % dwell socket (Fig. 3).

20 **Ground positive low tension** lead **to distributor case** (Fig. 3).

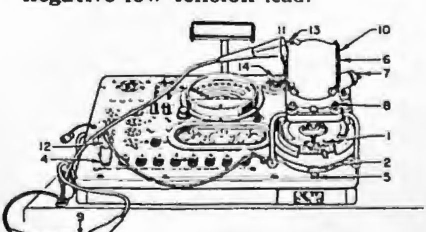


Fig. 1

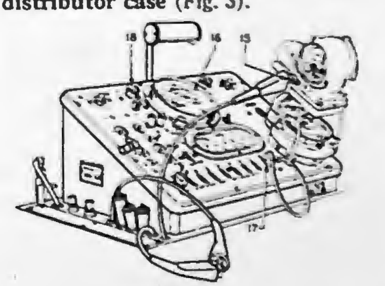


Fig. 2

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL V-8

May 1, 1941

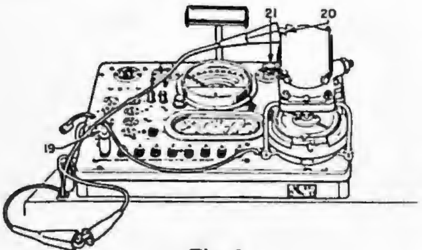


Fig. 3

21 Adjust reading to exactly **100%** with dwell rheostat. (with stroboscope running at 500 R.P.M.).

22 Connect **positive low tension** lead **to condenser terminal.**

23 Adjust left hand points to obtain the following reading:

Models 18, 40A and 40B..............60%
All other models......................50%

(The left hand points control the timing and a much higher degree of accuracy is obtained than is possible by any other means).

24 Remove the **Insulation from** the right hand **points.**

25 Adjust the **right hand points until** a reading of **80%** is obtained for the combined points.

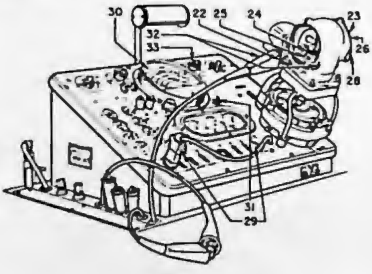


Fig. 4

26 Stop stroboscope and **insulate** the **left hand points** apart. **Start stroboscope.** Dwell of the right hand points should now be within the following limits:

Models 18, 40A and 40B.......55% to 65%
All other models..............45% to 55%

27 If not within these **limits,** breaker plate is in error.

28 Remove insulation from left hand **points.**

29 Plug meter **in M.P.H.** socket and **set** speed at **2000 R.P.M. then plug** meter on top of **adapter** in % dwell socket and observe dwell at this speed.

Dwell should be within the following limits at 2000 distributor R.P.M.:

Models 18, 40A and 40B.......68% to 80%
All other models...............78% to 80%

30 If the reading falls **below** these **limits** breaker arm spring tension is weak or breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.

31 Stop stroboscope.

32 Connect **positive low tension** lead **to distributor case.**

33 Adjust % of dwell rheostat **to** obtain reading of **zero ohms on scale "R".**

(Continued on page 71)

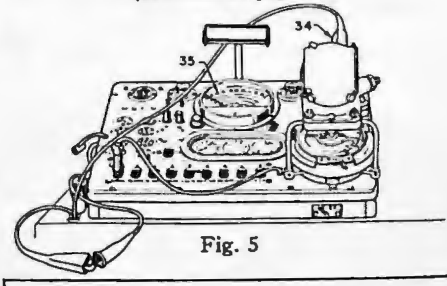


Fig. 5

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL V-8	HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

V-8 Ignition Tests (cont.)

(*Continued from page 70*)

34 Connect **positive low tension** lead **to input terminal of** the **coil.**

35 If no reading is obtained turn distributor shaft until points are closed.

36 If with the **points closed no reading** is obtained, continuity of coil primary is broken.

37 Reading on scale "R" indicates the resistance of the **coil primary in ohms.**

38 Install special cap on the distributor and **plug** lead from this cap **into** stroboscope **base.**

39 Plug meter **in M.P.H.** socket.

40 Set stroboscope **speed at 150 R.P.M.** This can be done easily by setting the speed at approximately 500 R.P.M. and slowing it down to 150 R.P.M. by screwing the vacuum brake assembly in with the fingers.

(These distributors start to advance at 200 R.P.M. therefore it is necessary to set the timing at some point below this speed).

41 Set **peep sight at zero** spark advanced.

42 Adjust the **timing** of the distributor so that the timing light through the small round hole in the stroboscope disc is in line with the peep sight.

43 Remove vacuum brake and set speed of stroboscope as follows:

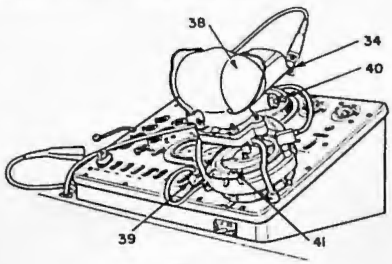


Fig. 6

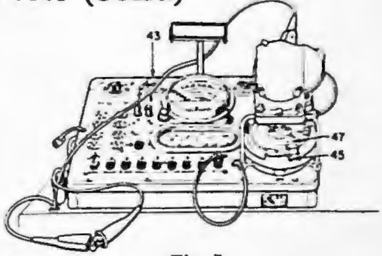


Fig. 7

Model 18	850 R.P.M.
Models 40A and 40B	1500 R.P.M.
Models 68 and 78	950 R.P.M.
Model 11A	600 R.P.M.

44 Speeds given above represent the speed at which **maximum advance** is reached (vacuum brake must have been removed).

45 Set the **peep sight** in line **with** the **timing light.**

46 Spark advance at these speeds **should be** as follows:

Model 40A	12½ to 11½ degrees
Model 11A	11½ to 10½ degrees
All other V-8	8½ to 7½ degrees

47 Observe the eight bright lines of the stroboscopic **image at various speeds.**

48 If the bright **lines have a jog** in them greater than the width of the line the cam is worn or the distributor shaft is bent and should be replaced—the width of the line represents one degree of error).

49 Momentarily run the stroboscope at **high speed. If** the bright **lines** appear to **dance** this indicates that the points are bouncing or are not closing uniformly.

If the speed at which this occurs is within the range of operation for the car, trouble will be experienced on the road at the R.P.M. indicated on the meter.

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:

ALL V-8

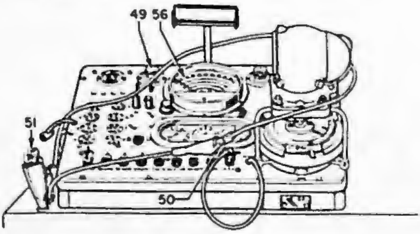


Fig. 8

50 **Stop stroboscope and** connect **positive high tension** lead **to special cap** on distributor.

51 **Disconnect negative interrupter** lead **from negative low tension** lead.

52 **Disconnect positive low tension** lead **and connect negative interrupter** lead **to input terminal** of the **coil.**

53 **The points must be closed** to complete the primary circuit.

54 Allow the coil to **set** for **5 minutes** thus connected **to warm** the **coil.**

55 Set the **spark gap selector at 120 lbs.** compression.

56 Set **speed at 500 R.P.M.** (scale "S").

57 **Plug meter into milliamp** socket.

58 Any reading **above ½ milliamp** is **satisfactory** for this speed.

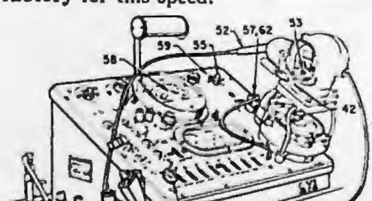


Fig. 9

59 **Set spark gap** selector **at 60 lbs.** compression.

60 Plug **meter in M.P.H.** socket.

61 **Set** stroboscope speed **at 2250 R.P.M.**

62 Plug **meter in milliamp** socket.

63 Reading **should be above ½ milliamp** if not coil is apt to miss at high speeds.

64 **Stop stroboscope** and plug **meter into M.P.H.** socket.

65 **Plug** lead from special **distributor cap into** stroboscope **base.**

66 Connect **negative interrupter** lead **to negative low tension** lead.

67 Connect **positive low tension** lead **to input terminal of** the **coil.**

68 **Start stroboscope** and **adjust % of dwell rheostat to sharpen** timing **light** if required.

69 **Set peep sight** as follows:

Models 18, 40A and 40B	0 degrees
All other V-8	2 degrees

70 **Install vacuum brake and adjust** to retard spark to the peep sight while the distributor is being driven at the following speeds:

Models 18, 40A and 40B	425 R.P.M.
Models 68 and 78	950 R.P.M.
Model 11A	650 R.P.M.

71 **Stop stroboscope. Remove** the **adapter** from the % of dwell socket **when finished** otherwise you may damage the test set on other tests.

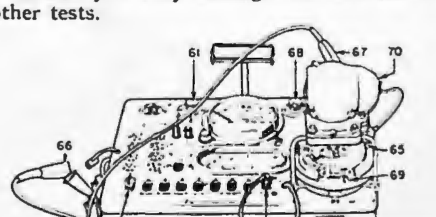


Fig. 10

ABOVE APPLIES TO MODELS:

ALL V-8

EQUIPMENT USED

HEYER–HI-FORD LABORATORY TEST SET
HEYER–HI-DFZ–DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

V-12 IGNITION TESTS

OPR. 12000-A

TEST V-12 IGNITION (ON THE CAR)

This operation merely is a test procedure and not a correction. Where the car fails to meet the standards outlined here correction should be made.

1 Wipe off the spark plug porcelains.

2 If you have just completed opr. 10505-A proceed with paragraph 12 otherwise proceed as follows; **Set BRS plate area selector** to area of battery being tested. (3050 for 1940-41 cars see specifications section for other batteries.)

3 **Plug meter in BRS** attachment.

4 **Install BRS leads on battery terminals** (it is not necessary to remove cables).

5 **Adjust load rheostat so meter reads 100% on scale "M"**, then **press** BRS **test button and** again **read on scale "M"** of meter. Reading will indicate condition of the battery. **If** reading is **below 70% see Opr. 10655-A.**

Back off load rheostat.

6 **Start engine and set speed at approximately 1250 R.P.M.**

7 **Turn on head light country beam.**

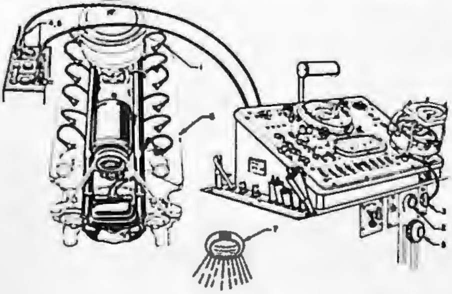


Fig. 1

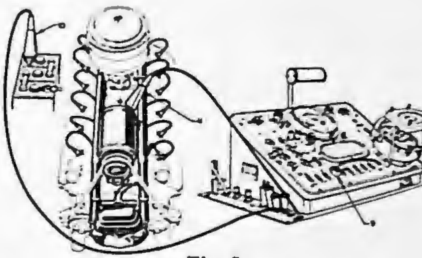


Fig. 2

8 **Remove BRS leads from the battery.**

9 **Plug meter in 3 volt socket.**

10 **Contact positive battery post with negative low tension lead.**

11 **Contact generator** ground brush or the generator **case with positive low tension lead.**

Reading should be less than .1 (1/10) volt. (Less than 4 on "B" scale.) Otherwise excessive resistance exists in the ground circuit.

Turn headlights off.

12 **Plug meter in** % of **dwell socket.**

13 Connect **positive low tension** lead **to positive post of the battery.**

14 Connect the **negative low tension** lead **to the negative post** of the battery.

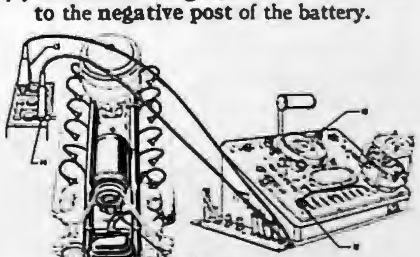


Fig. 3

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-BRS ATTACHMENT
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL LINCOLN-ZEPHYR
LINCOLN STARTING 1941

May 1, 1941

15 Adjust % of dwell rheostat to read zero on scale "R".

16 Disconnect input wire from right hand coil and connect the negative low tension lead to the wire removed from the right hand coil.

17 Connect the positive low tension lead to the input terminal of right hand coil.

18 Turn the ignition switch on.

19 If no reading is now obtained turn the crankshaft slightly to close the breaker points.

20 Reading on scale "R" will be the resistance of the entire primary circuit through the right hand coil in ohms.
This should be between 1.00 and 1.35 ohms.

21 Adjust % of dwell rheostat to obtain reading of eactly 100% on scale "B".

22 If the battery in the car is so low in charge that it is impossible to obtain 100% reading connect the negative high tension lead to the positive post of the battery and the negative interrupter lead to the negative post of the battery. This will place the test set battery in parallel to the battery in the car and should enable this setting to be made (recommend battery in the car be charged).

23 Start the engine and run at idle speed. Reading on all V-12 distributors should be between 40% and 55% dwell at idle speeds.

24 High readings indicate right hand breaker point gap is too small.

25 Low readings indicate that gap is either too large or the points are low in conductivity.

26 Speed the engine momentarily to high speed and observe dwell at high speed.

27 Reading should not drop below 15 on the "B" scale.

28 Lower readings indicate low breaker arm spring tension or friction at the breaker arm bearing.

29 Reconnect input wire to right hand coil and disconnect input wire from left hand coil. Connect negative low tension lead to this wire. Connect positive low tension lead to input terminal of left hand coil.

30 If no reading is now obtained turn the crankshaft slightly to close the breaker points.

31 Reading on scale "R" will be the resistance of the entire primary circuit through the left hand coil in ohms. This should be between 1.00 and 1.35 ohms.

32 Adjust % of dwell rheostat to obtain reading of exactly 100% on scale "B".

(Continued on page 85)

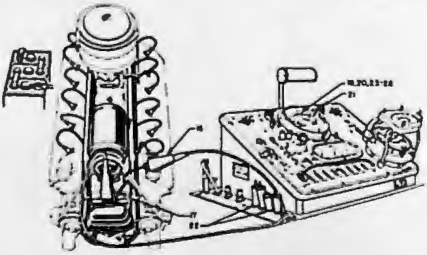


Fig. 4

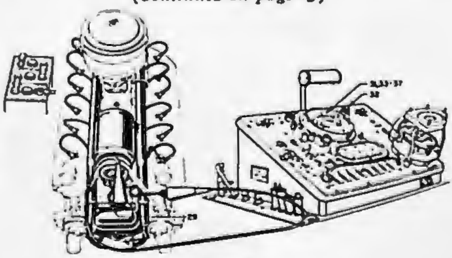


Fig. 5

ABOVE APPLIES TO MODELS:

ALL LINCOLN-ZEPHER
LINCOLN STARTING 1941

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-BRS ATTACHMENT
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

V-12 Ignition Tests (Cont.)

(*Continued from page 84*)

33 **Start** the **engine** and run at idle speed. **Reading should be between 40% and 55%** dwell **at idle** speed.

34 **High readings** indicate left hand breaker point gap is too small.

35 **Low readings** indicate that gap is either too large or the left hand points are low in conductivity.

36 Speed the **engine momentarily to high speed** and observe dwell.

37 **Reading should not drop below 15** on the "B" scale.

38 **Reconnect** the **wire** that was removed from the input terminal of the left hand coil.

39 Again start the **engine** and allow it to run **at idle speed.**

40 **Ground** the **negative high tension** lead **to the engine.**

41 Set the spark **gap selector at 120 lbs.**

42 Clip the **positive high tension** lead to the **end of number 1 spark plug wire** while it is still on the plug.

43 **Lift** the **spark plug wire from** the spark **plug.**

44 **Spark should jump** the visible **gap** in the test set **regularly** without missing.

45 **Repeat** the above test **from all spark plug wires.**

46 Set the **spark gap** selector **at "SP"** position.

47 Connect the **positive high tension** lead **to spark plug terminals** (wires in place).

48 **If** the **spark jumps** the **visible gap** the **resistance** of the spark plug is **too high.** (Recommend sand blast cleaning and re-spacing.)

49 **Repeat** the above test **on all spark plugs.**

50 **Stop** the **engine.**

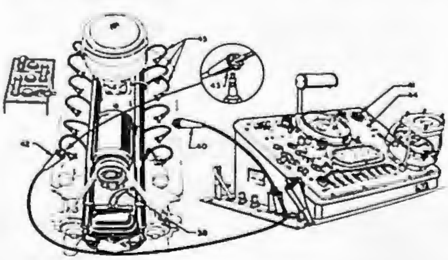


Fig. 6

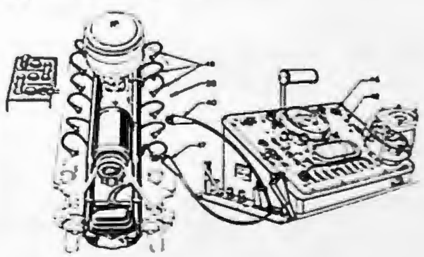


Fig. 7

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-BRS ATTACHMENT
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL LINCOLN-ZEPHYR
LINCOLN STARTING 1941

This quality of service to a large degree depends on the dealer realizing the value of good service and its effect on future sales.

Better service can be assured if the dealer personally investigates conditions on his service floor and shop, also solicits comments from his service customers.

Only by this personal check can he determine whether or not his service is the type that he would like to receive if he were an owner.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL LINCOLN-ZEPHYR LINCOLN STARTING 1941	HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-BRS ATTACHMENT HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE

V-12 Ignition Tests (cont.)
OPR. 12000-B

TEST AND ADJUST V-12 DISTRIBUTOR AND COIL

1 **Set** stroboscope **disc** at **37½ degrees** (see Fig. 1).

2 **Set timing index** as follows:

MODEL	ENGINE H-45530 to H-57738	ENGINE All Other Engines
H	TDC	2° before TDC
16H	1° before TDC	1° after TDC

3 Test set **battery must be 6 volts** minimum this is important.

4 Plug **adapter in % of dwell socket.** (Adapter must be removed when testing test set battery voltage).

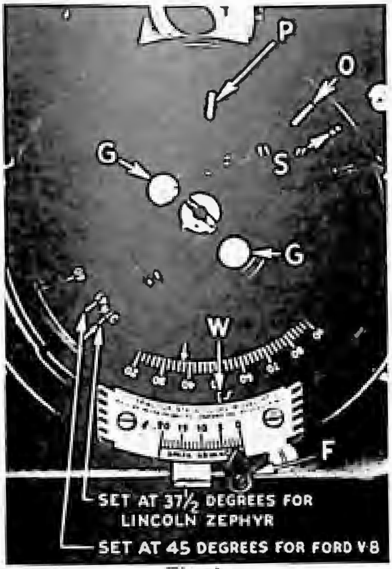


Fig. 1

5 **Open** this **test set** interrupter **points.** (This is accomplished by pulling out the small handle at base of stroboscope).

6 **Examine** breaker **points.** Replace points (or distributor) if burned or pitted.

7 **Loosen** the **vacuum brake** assy. in the distributor housing. However don't take it all the way out as it can be used to stabilize the stroboscope speeds in the lower speed ranges.

The vacuum brake should be loosened **before** the **distributor is mounted** on the stroboscope otherwise considerable strain is placed on the fixture.

8 **Install** the distributor **on** the **stroboscope.**

9 Connect **negative interrupter** lead to **negative low tension** lead.

10 Turn distributor shaft until **left hand points** are **closed.** (Left or right is as viewed from the drivers seat not as viewed from the front of the test set).

11 **Plug meter** on top of adapter **in** % of **dwell socket.**

12 Ground **positive low tension** lead **to distributor case.**

13 **Adjust** reading **to zero ohms** (Scale "R") with dwell rheostat.

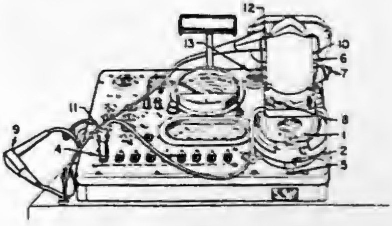


Fig. 2

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL LINCOLN-ZEPHYR
ALL LINCOLN STARTING 1941

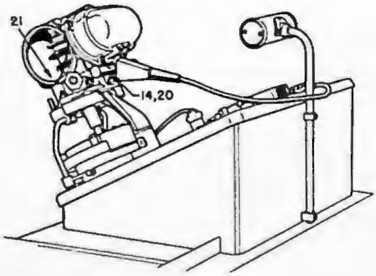


Fig. 3

14 Connect positive low tension lead to left hand condenser terminal.

15 If contact resistance of left hand points on scale "R" exceeds .1 (1/10) ohm points must be replaced.

16 Plug meter in M.P.H. socket.

17 Ground positive low tension lead to distributor case.

18 Set stroboscope speed (left hand rotation) at 500 R.P.M.

19 Plug meter on adapter in % of dwell socket and adjust reading to exactly 100% dwell with rheostat.

20 Connect positive low tension lead to left hand condenser terminal.

21 Adjust left hand points to 60% dwell.

22 Plug meter in M.P.H. socket.

23 Set stroboscope speed at 2000 R.P.M.

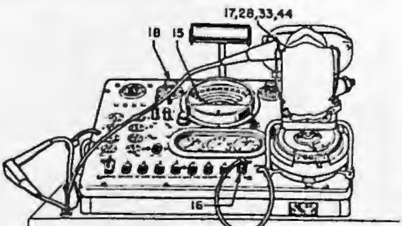


Fig. 4

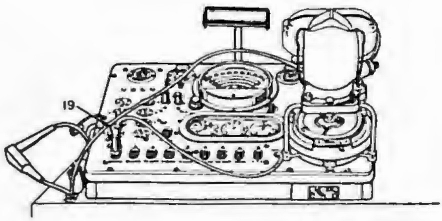


Fig. 5

24 Plug meter on top of adapter in % of dwell socket (Fig. 7).

25 Dwell at this speed should be between 58% and 60% (Fig. 7).

26 If the reading falls below these limits breaker arm spring tension is weak or breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.

27 Stop stroboscope (Fig. 7).

28 Ground positive low tension lead to distributor case (Fig. 4).

29 Adjust reading to zero ohms (Scale "R") with dwell rheostat (Fig. 7).

30 Connect positive low tension lead to right hand condenser terminal (Fig. 8).

(Continued on page 91)

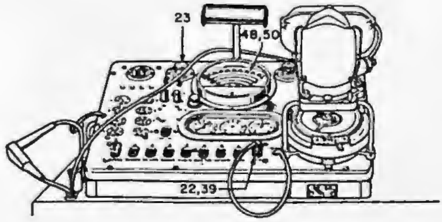


Fig. 6

ABOVE APPLIES TO MODELS:

ALL LINCOLN-ZEPHYR
ALL LINCOLN STARTING 1941

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

V-12 Ignition Tests (cont.)

(Continued from page 90)

31 If **contact resistance of right** hand **points** on scale "R" exceeds .1 (1/10) ohm points must be replaced. (If no reading is obtained turn distributor shaft until right hand points are closed.)

32 Plug **meter in M.P.H.** socket.

33 Ground **positive low tension** lead **to distributor case** (Fig. 4).

34 **Set** stroboscope speed **at 500 R.P.M.**

35 Plug **meter** on adapter **in %** of **dwell** socket.

36 **Adjust** reading **to** exactly **100%** dwell with rheostat.

37 Connect **positive low tension** lead **to right** hand **condenser terminal.**

38 **Adjust right** hand **points to 60%** dwell.

39 Plug **meter into M.P.H.** socket (Fig. 6).

40 Set stroboscope **speed at 2000 R.P.M.**

41 Plug **meter** on adapter **in %** of **dwell** socket.

42 Dwell at this speed **should be between 58% and 60%.**

43 **If** the reading falls **below** these **limits** right hand breaker arm spring tension is weak or the breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.

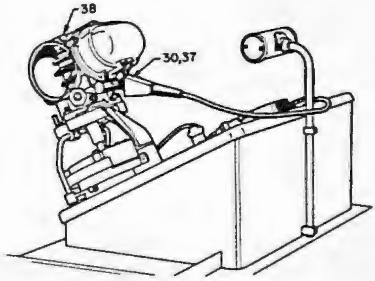


Fig. 8

44 **Stop stroboscope** and connect **positive low tension** lead **to distributor case** (Fig. 4).

45 **Adjust** reading **to zero ohms** (Scale "R") with dwell rheostat.

46 Connect **positive low tension** lead **to input** terminals **of both coils** (Figs. 9 and 10).

47 Turn distributor shaft until **left hand points** are **closed** (right hand points open) (Fig. 10).

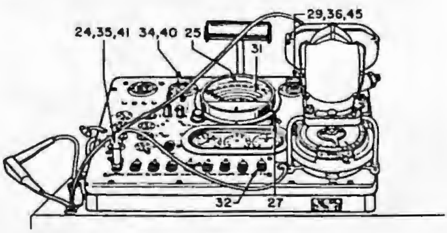


Fig. 7

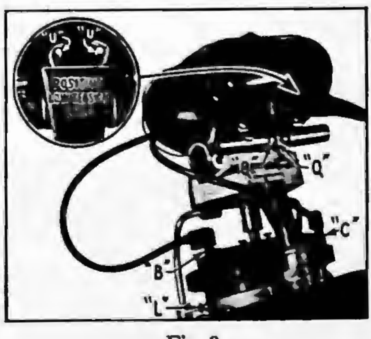


Fig. 9

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL LINCOLN-ZEPHYR ALL LINCOLN STARTING 1941

Printed in U.S.A.

May 1, 1941

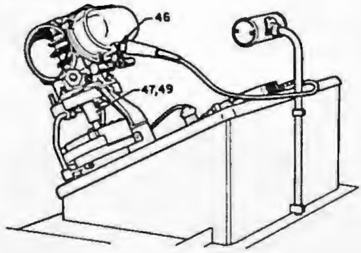


Fig. 10

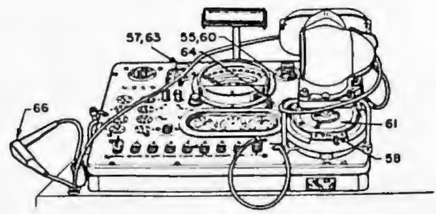


Fig. 12

48 Reading on scale "R" will be the **resistance of left** hand **coil and points** (Fig. 6).

49 Turn the distributor shaft until **right** hand **points** are **closed** (left hand points open).

50 Reading on scale "R" will be the **resistance** of the **right** hand **coil and points.**

51 Install special cap on the distributor and **plug** the leads from this cap **into** the **stroboscope base.**

52 Plug **meter into M.P.H.** socket.

53 Set stroboscope **speed at 150 R.P.M.** This can be done easily by setting the speed at approximately 500 R.P.M. and slowing it down to 150 R.P.M. by screwing the vacuum brake assy. in with the fingers. (These distributors start to advance at 200 R.P.M. Therefore it is necessary to set the timing at some point below this speed.)

54 Set the **peep sight at zero** spark advance.

55 Adjust the **timing** of the distributor so that the timing light through the small hole in the stroboscope disc is in line with the peep sight.

56 Remove the **vacuum brake.**

57 Set the **speed** of the stroboscope **at 650 R.P.M.** This represents the speed at which maximum advance is reached.

58 Set the **peep sight** in line **with** the **timing light.**

59 Spark advance at this speed for 16-H distributor **should be** from 11 to 12 degrees, for all other distributors should be from 7½ degrees to 8½ degrees.

60 Synchronize the **points** by adjusting until the broken line nearest and to the right of the peep sight is straightened into one continuous line (Figs. 12, 13 and 14).

61 The **stroboscopic image** will consist of 6 continuous and 6 broken lines, disregard the broken lines in making diagnosis (Figs. 12 and 14).

(Continued on page 93)

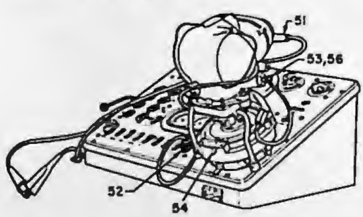


Fig. 11

Fig. 13

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL LINCOLN-ZEPHYR ALL LINCOLN STARTING 1941	HEYER—HI-FORD LABORATORY TEST SET HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

V-12 Ignition Tests (cont.)

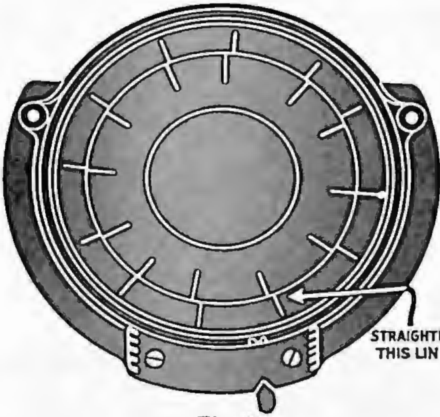


Fig. 14

(*Continued from page 92*)

62 **If** the 6 continuous **lines have a jog** in them greater than the width of the line, the cam is worn or the distributor shaft is bent and should be replaced. (The width of the line represents one degree of error.)

63 **Momentarily** run the stroboscope **at high speed** (Fig. 12). If the bright lines appear to dance this indicates that the points are bouncing or are not closing uniformly. If the speed at which this occurs is within the range of operation of the car, trouble will be experienced on the road at the R.P.M. indicated on the meter.

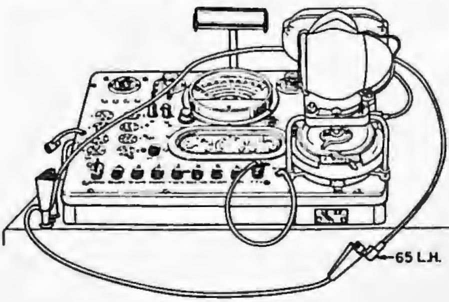


Fig. 15

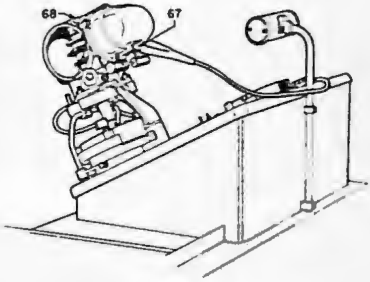


Fig. 16

64 **Stop** the **stroboscope** (Fig. 12).

65 Connect the **positive high tension lead to lead for left hand coil from** the **special cap** on the distributor (Fig. 15).

66 **Disconnect** the **negative interrupter** lead **from** the **negative low tension** lead (Fig. 12).

67 **Disconnect positive low tension** lead **and connect negative interrupter** lead to input **terminal of both coils.**

68 **Left** hand **points** must be **closed** to complete the primary circuit.

69 Allow the coil to set for 5 minutes thus connected to **warm the coil.**

70 Set the spark **gap selector at 120 lbs.** compression (Fig. 17).

71 **Set** the stroboscope **speed at 500 R.P.M.**

72 Plug the **meter into** the **milliamp** socket (Fig. 17).

73 Any reading **above ½ milliamp is satisfactory** for this speed.

EQUIPMENT USED
HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

ABOVE APPLIES TO MODELS:
ALL LINCOLN-ZEPHYR
ALL LINCOLN STARTING 1941

Printed in U.S.A.

May 1, 1941

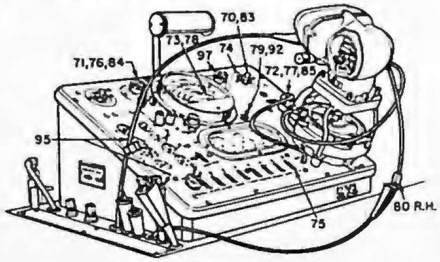


Fig. 17

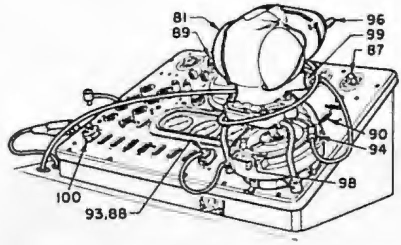


Fig. 18

74 Set spark gap selector at 60 lbs. compression.

75 Plug meter into M.P.H. socket.

76 Set stroboscope speed at 2250 R.P.M.

77 Plug meter into milliamp socket.

78 Reading should be above ½ milliamp. If not, coil is apt to miss at high speeds.

79 Stop stroboscope.

80 Connect positive high tension lead to lead for right hand coil from special cap on distributor.

81 Right hand points must be closed to complete the primary circuit.

82 Allow the coil to set for 3 minutes thus connected to warm the coil.

83 Set spark gap selector at 120 lbs. compression.

84 Plug meter in M.P.H. socket and set speed at 500 R.P.M. (scale "S").

85 Plug meter into milliamp socket.

86 Any reading above ½ milliamp is satisfactory for this speed.

87 Set spark gap selector at 60 lbs. compression.

88 Plug meter into M.P.H. socket.

89 Set stroboscope speed at 2250 R.P.M.

90 Plug meter into milliamp socket.

91 Reading should be above ½ milliamp if not coil is apt to miss at high speeds.

92 Stop stroboscope.

93 Plug meter into M.P.H. socket.

94 Plug leads from special distributor cap into stroboscope base.

95 Connect negative interrupter lead to negative low tension lead.

96 Connect positive low tension lead to input terminals of both coils and start stroboscope.

97 Adjust % of dwell rheostat to sharpen timing light.

98 Set peep sight at 2 degrees.

99 Install vacuum brake and adjust to retard spark to the peep sight while the distributor is being driven at the following speeds:

Model H .... 950 R.P.M.
Model 16-H .... 650 R.P.M.

100 Stop stroboscope and remove the adapter from the % of dwell socket when finished otherwise you may damage the test set on other tests.

ABOVE APPLIES TO MODELS:

ALL LINCOLN-ZEPHYR
ALL LINCOLN STARTING 1941

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ—DISTRIBUTOR STROBOSCOPE

May 1, 1941

Printed in U.S.A.

LINCOLN IGNITION TESTS

The "K" Series Lincoln distributor is entirely different in appearance than either the Ford V-8 or Lincoln-Zephyr.

Timing is accomplished by setting the distributor to marks on the flywheel.

In some respects the Lincoln distributor is similar to the Lincoln-Zephyr in that each of the two sets of points provide ignition for six cylinders and that the points must be timed with each other or synchronized.

The mechanic servicing the "K" Series Lincoln distributor should secure the "DE-CON" adapter for the distributor stroboscope and in that way will be able to synchronize the points, set the dwell correctly and check the action of the distributor governor weights.

In these distributors the coils are separate from the distributor and unlike the Lincoln-Zephyr distributor they are separate from each other.

TIMING

The timing of distributors starting in 1935 is set on the flywheel dead center marks.

Distributors prior to 1935 are set at the marks A2 and A1.

OPR. 12000-B

TEST AND ADJUST "K" SERIES V-12 DISTRIBUTOR AND COIL

1 Set stroboscope **disc** at **32½ degrees** on **1932-33** V-12 Lincoln **cars.**

2 Set 37½ **degree mark** on the **disc** at the **56 degree mark** on the outer **disc** on V-12 "K" Series Lincolns **after 1934.**

3 Test set **battery must be 6 volts** minimum; this is important.

4 Plug **adapter in % of dwell socket.** (Adapter must be removed when testing test set battery voltage.)

5 **Open** the **test set** interrupter **points.** (This is accomplished by pulling out the small handle at base of stroboscope.)

6 Install **Lincoln adapter** on stroboscope.

7 **Install** the distributor **on** the **stroboscope.**

8 **Examine** breaker **points.** Replace points if burned or pitted.

9 Connect **negative interrupter** lead **to negative low tension** lead.

10 Turn distributor shaft until the **fixed points** are **closed.**

11 **Plug meter** on top of adapter **in %** of **dwell socket.**

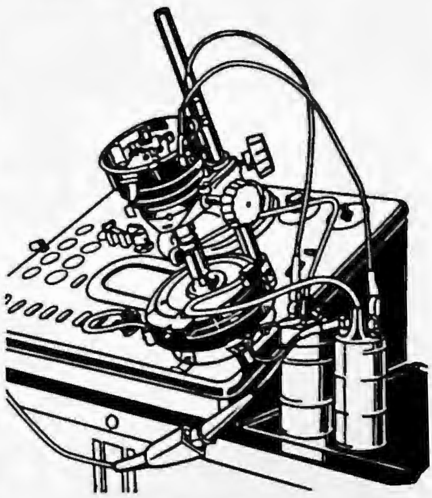


Fig. 1

EQUIPMENT USED

HEYER—H1-FORD LABORATORY TEST SET
HEYER—H1-DFZ DISTRIBUTOR STROBOSCOPE
HEYER—DECOB-LINCOLN ADAPTER
HEYER—DEBEC-LINCOLN TEST LEADS

ABOVE APPLIES TO MODELS:

ALL LINCOLN V-12 "K" SERIES

Printed in U.S.A.

April 16, 1941

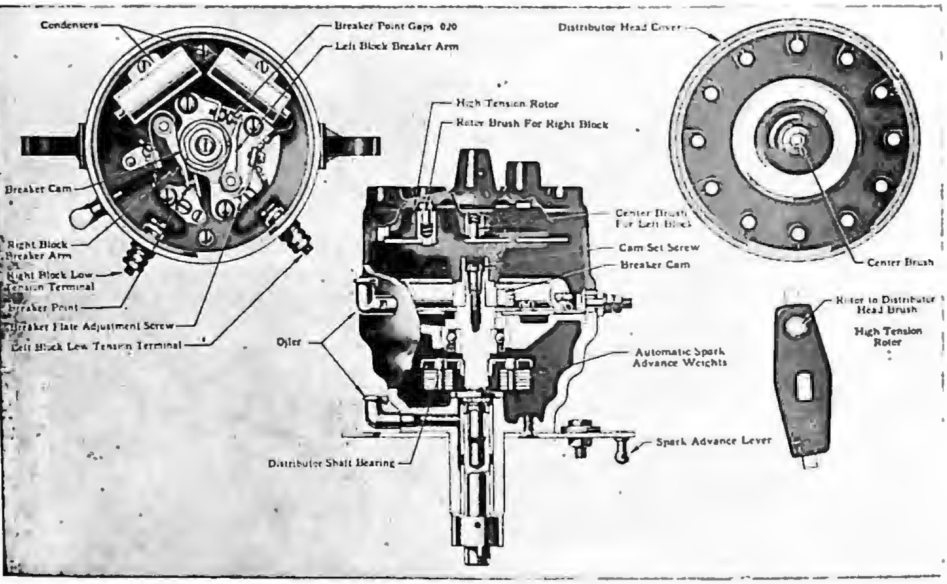


Fig. 2

12 Ground **positive low tension** lead to **distributor case.**

13 **Adjust** reading **to zero ohms** (scale R) with dwell rheostat.

14 Connect **positive low tension** lead to terminal for **fixed points.**

15 If **contact resistance of** the fixed points on scale "R" exceeds .1 (1/10) ohm, points must be replaced.

16 Plug **meter in M.P.H.** socket.

17 Ground **positive low tension** lead to **distributor case.**

18 **Set** stroboscope speed **at 500 R.P.M.**

19 Plug **meter** on adapter **in %** of **dwell** socket **and adjust** reading to exactly **100%** dwell with rheostat.

20 Connect **positive low tension** lead to terminal for **fixed points.**

21 **Adjust fixed points to 60%** dwell.

22 Plug **meter in M.P.H.** socket.

23 Set stroboscope **speed at 2000 R.P.M.**

24 Plug **meter** on top of adapter **in %** of **dwell** socket.

25 **Dwell** at this speed **should be between 58% and 60%.**

26 **If** the reading falls **below** these **limits** breaker arm spring tension is weak or breaker arm is binding on its bearing. Test breaker arm spring tension, if OK, lubricate bearing with M-4601 distributor grease.

Continued on Page 111

ABOVE APPLIES TO MODELS:

ALL LINCOLN V-12 "K" SERIES

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE
HEYER—DECOB-LINCOLN ADAPTER
HEYER—DEBEC-LINCOLN TEST LEADS

April 16, 1941

Lincoln Ignition Tests (Cont.)

Continued from Page 110

27 **Stop stroboscope.**
28 Ground **positive low tension** lead **to distributor case.**
29 **Adjust** reading **to zero ohms** (scale R) with dwell rheostat.
30 Connect **positive low tension** lead **to** terminal for **movable points.**
31 If **contact resistance of the movable points** on scale "R" exceeds .1 (1/10) ohm points must be replaced. (If no reading is obtained turn distributor shaft until the moveable points are closed.
32 Plug **meter in M.P.H.** socket.
33 Ground **positive low tension** lead **to distributor case.**
34 **Set** stroboscope speed **at 500 R.P.M.**
35 Plug **meter** on adapter **in** % of **dwell** socket.
36 **Adjust** reading **to** exactly **100%** dwell with rheostat.
37 Connect **positive low tension** lead **to** terminal for **movable points.**
38 **Adjust movable points to 60%** dwell.
39 Plug **meter into M.P.H.** socket.
40 Set stroboscope **speed at 2000 R.P.M.**
41 Plug **meter** on adapter **in** % of **dwell** socket.
42 Dwell at this speed **should be between 58% and 60%.**
43 If the reading falls **below** these **limits** the breaker arm spring tension is weak or the breaker arm is binding on its bearing. Test breaker arm spring tension, if OK lubricate bearing with M-4601 distributor grease.
44 Connect **positive low tension** lead **to distributor case.**
45 **Adjust** reading **to zero ohms** with dwell rheostat.
46 **Install special high tension leads** (DE-BEC) **from both coils to stroboscope.**
47 Connect **positive low tension** lead **to one primary** terminal **of** each **coil.** Use pecial connector (DEBEG) See Fig. 1.
48 Connect **special wires** (DEBED) from the other **primary terminals** of each **coil** to the **terminals** on the distributor which connects to the breaker points. See Fig. 1.
49 Turn distributor shaft until the fixed **points** are **closed.**
Reading on scale "R" will be the **resistance** of the **fixed points** and **one coil.**
50 Turn the distributor shaft until the **movable points** are **closed** (fixed points open).
51 Reading on scale "R" will be the **resistance** of the **movable points** and **one coil.**
52 Plug **meter into** M.P.H. socket.
53 Set stroboscope **speed at 150 R.P.M.**
54 Set the **peep sight at zero** spark advance.
55 **Adjust** the **timing** of the distributor by loosening the universal **clamp and rotate** the **Distributor** so that the small red **timing light** on the stroboscope disc **lines up with** the **peep sight.**
56 Set the **speed** of the stroboscope **at 1750 R.P.M.** This represents the speed at which maximum advance is reached.
57 **Set** the **peep sight** in line with **timing light.**
58 **Spark advance** at this speed should be from 7½ degrees to 8½ degrees.
59 **Synchronize** the **points** by loosening the screws holding the movable plate in the base of the distributor until the broken line nearest and to the right of the peep sight is straightened into one continuous line. See Fig. 3.
60 The **stroboscopic image** will consist of 6 continuous and 6 broken lines; disregard the broken lines in making diagnosis.
61 If the 6 continuous **lines have a jog** in them greater than the width of the line, the cam is worn or the distributor shaft is bent and should be replaced. (The width of the line represents one degree of error.)
62 **Momentarily** run the stroboscope **at high speed.** If the bright lines appear to

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE
HEYER—DECOB-LINCOLN ADAPTER
HEYER—DEBEC-LINCOLN TEST LEADS

ABOVE APPLIES TO MODELS:

ALL LINCOLN V-12 "K" SERIES

April 16, 1941

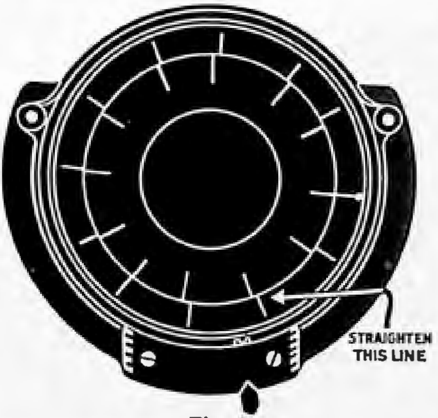


Fig. 3

dance this indicates that the points are bouncing or are not closing uniformly.

If the speed at which this occurs is within the range of operation of the car, trouble will be experienced on the road at the R.P.M. indicated on the meter.

63 **Stop** the **stroboscope.**

64 Connect the **positive high tension lead** to the **high tension terminal** of one coil only.

65 **Disconnect** the **negative interrupter** lead **from** the **negative low tension** lead

66 **Disconnect positive low tension** lead **and connect negative interrupter** lead to the **low tension terminal of one coil.**

67 The other **low tension terminal** of the **coil should be connected to one of the low tension terminals on the distributor.**

68 **The points should be closed to complete the primary circuit.**

69 Allow the coils to set for 5 minutes thus connected, to **warm the coil.**

70 Set the spark **gap selector at 120 lbs.** compression.

71 **Set** the stroboscope **speed at 500 R.P.M.**

72 Plug the **meter into** the **milliamp socket.**

73 Any reading **above ½ milliamp is satisfactory** for this speed.

74 **Set** spark **gap** selector at **60 lbs.** compression.

75 Plug **meter into M.P.H.** socket.

76 Set stroboscope **speed at 2250 R.P.M.**

77 Plug **meter into milliamp socket.**

78 Reading **should be above ½ milliamp,** if not, coil is apt to miss at high speeds.

79 **Stop stroboscope.**

80 Connect the **positive high tension lead** to the **high tension terminal** of the other coil. Connect **negative interrupter lead** to the **low tension terminal** of the **other coil.**

81 The **other low tension terminal** of this **coil** should be connected to one of the **low tension terminals** of the **distributor.**

The **points** should be closed to complete the primary circuit.

82 Allow the coil to set for 5 minutes thus connected to **warm the coil.**

83 Set the spark **gap selector at 120 lbs.** compression.

84 **Set** the stroboscope **speed at 500 R.P.M.**

85 Plug the **meter into** the **milliamp socket.**

86 Any reading **above ½ milliamp is satisfactory** for this speed.

87 **Set** spark **gap** selector at **60 lbs.** compression.

88 Plug **meter into M.P.H.** socket.

89 Set stroboscope **speed at 2250 R.P.M.**

90 Plug **meter into milliamp socket.**

91 Reading **should be above ½ milliamp,** if not, coil is apt to miss at high speeds.

ABOVE APPLIES TO MODELS:

ALL LINCOLN V-12 "K" SERIES

EQUIPMENT USED

HEYER—HI-FORD LABORATORY TEST SET
HEYER—HI-DFZ DISTRIBUTOR STROBOSCOPE
HEYER—DECOB-LINCOLN ADAPTER
HEYER—DEBEC-LINCOLN TEST LEADS

April 16, 1941

IGNITION COIL

The ignition coils used on all automobiles consists of a primary and secondary winding insulated from each other and wound around a soft iron core which becomes magnetized when current passes through the primary circuit.

When the primary current is interrupted by the opening of the breaker points, the magnetic field collapses, which causes an Electro-Motive-Force in both the primary and the secondary windings. The E-M-F from the secondary discharges across the spark plug gap which ignites the fuel-air mixture in the cylinders.

This high tension current must have sufficient voltage or pressure to jump the spark plug gap under the compressions encountered in the engine. Since the highest compressions are encountered under maximum load at the lower speeds, poor coil performance often is noticeable on acceleration.

While the high tension current must have sufficient voltage to jump the spark plug gap it is also important that the amperage be high enough to produce sufficient heat to ignite the mixture in the cylinder. It has been found that .5 (five tenths) milliamp is the lowest amperage that will consistently ignite the mixture.

As the compression in the engine increases the voltage automatically increases to overcome this added resistance.

As the voltage increases the amperage decreases.

Another requirement of the coil is that it be able to complete the cycle of its operation in the smallest amount of time possible. This is easy to appreciate when the fact that at 85 miles per hour the Ford V-8 coil must deliver approximately 280 sparks per second with sufficient amperage to ignite the mixture in the cylinder. Fortunately at these speeds the compression of the engine is low. Nevertheless, speeds are a factor and must be considered in testing coils.

Service of the car involves tests either with the distributor with which it is to be used as outlined in Operations 12000-A and 12000-B, or tests of the coil alone. Obviously **a more satisfactory test can be made with the distributor with which the coil is to be used** and it is suggested that whenever possible the coil and distributor be tested as a unit on the distributor Stroboscope as outlined in Operation 12000-B.

OPR. 12024-D

TEST COIL ON BENCH

Occasionally good coils are condemned due to mechanics failing to follow instructions for testing. Before condemning any coil be sure to follow the procedure exactly including the following preliminary work:

1 **Check** the **voltage** of the **battery** in the test set. A satisfactory test can not be made if battery voltage has dropped below six volts. Make sure that the test set **interrupter points** are **in good condition** and **correctly spaced.**

2 **Install** the **correct condenser** for the particular coil being tested **in** the condenser interrupter **clips** on the test set. Make sure the condenser used is a good one.

3 Connect the **negative interrupter lead to the input terminal** of the **coil.**

4 Connect the **positive interrupter lead to** the **output terminal** of the primary of the coil. (This will be the contact spring on V-8, V-12 and 4 cylinder coils.)

EQUIPMENT USED	ABOVE APPLIES TO MODELS:
HEYER H-1 FORD LABORATORY TEST SET	ALL

June 6, 1941

5 Push lever in base of stroboscope in so that test set points can close. **Make sure the points are closed** so as to complete the circuit and **allow** the coil **to set** thus connected to gently warm the coil **for 5 minutes.**

6 After coil has heated for five minutes, **pull the positive high tension lead all the way out.** This is important, for if the high tension lead is partially in the cabinet, the cabinet will have a capacity effect that may be reflected in the coil output readings.

Connect the **positive high tension lead** to the **high tension output terminal** of the coil. On the V-8, V-12 and 4 cylinder coils the carbon brush should be removed and replaced with a large cotter pin to which the positive high tension lead is then connected.

7 **Set** spark gap selector switch (see Fig. 1) **at 120.**

8 **Plug meter in MPH socket and set speed** (left hand rotation) **as follows:**

V-8 .... 500 RPM
V-12 .... 375 RPM
6 cylinder .... 375 RPM
4 cylinder .... 250 RPM

As soon as the interrupter is started, a **spark should occur regularly between the points of the visible spark gap** in the panel.

9 **Plug the meter into the milliamp soc**ket and observe **milliamp value of the spark, which should be greater than .5 milliamp.** (The limit given is .5, which is five tenths or ½ and not 5 milliamps.)

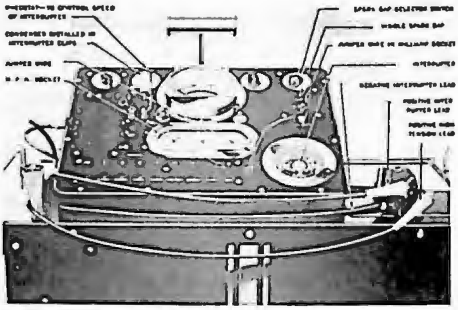


Fig. 1

10 **If the spark jumps the visible gap regularly, and you obtain a milliamp reading over ½ milliamp,** the coil will meet the requirements of maximum compression and low speed operation.

11 **Without stopping the interrupter, set the spark gap selector switch at 60.** (Compressions above 60 lbs. are never encountered at high speeds.)

12 **Plug meter into MPH socket and set speed as follows:**

V-8 .... 2000 RPM
V-12 .... 1500 RPM
6 cylinder .... 1500 RPM
4 cylinder .... 1000 RPM

13 **Plug meter into Milliamp socket.** Reading should be above .5 (½) milliamp at this speed.

ABOVE APPLIES TO MODELS:

ALL

EQUIPMENT USED

HEYER H-I FORD LABORATORY TEST SET

June 6, 1941

LIGHT CIRCUIT BREAKER

Starting in 1932 all Ford cars and trucks used a fuse to protect the lighting circuits from overload. The use of these fuses was completely discontinued in all models starting with 1940.

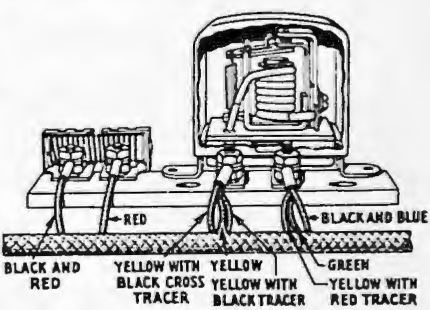
Lincoln-Zephyr cars since their inception have used a circuit breaker in the light circuits rather than a fuse. The type of circuit breaker used on the Lincoln-Zephyr from 1936 to 1939 inclusive is illustrated in Figure 1.

These same vibrator type of light circuit breakers were also adopted for partial production on various models of Ford, and Mercury cars during 1939.

The vibrator type of circuit breaker as illustrated in Figure 1 has a magnetic winding in series with a pair of contact points. When the current becomes excessive as would be true in the case of a short circuit, the current through this magnetic winding would be increased and the magnet would cause the points to open. This would break the circuit and the points would close by spring pressure.

The cycle explained above continues to repeat very rapidly with the result that the points vibrate making a buzzing noise audible to the driver.

Starting with all 1940 models of both cars and trucks a different type of circuit breaker as illustrated in Figure 2 was adopted.

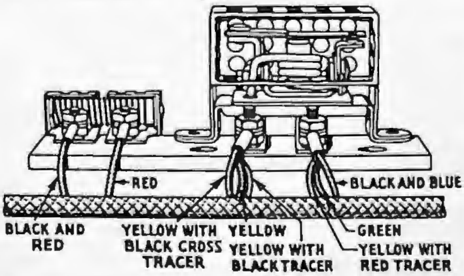


VIBRATOR TYPE CIRCUIT BREAKER

Fig. 1

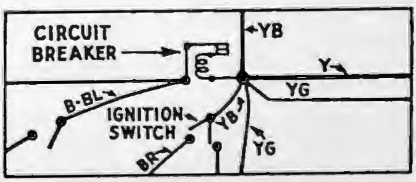
These circuit breakers have a bi-metal breaker arm. When the current becomes excessive the bi-metal heats and pulls away from the fixed contact point breaking the circuit.

As the bi-metal cools contact is again established and the circuit through the magnetic coil is completed and a firm contact is again established between the two points. This prevents "fluttering" of the points.



SINGLE COMBINATION THERMOSTATIC AND MAGNETIC CIRCUIT BREAKER

Fig. 2



SECTION OF 1940 WIRING DIAGRAM SHOWING CIRCUIT BREAKER

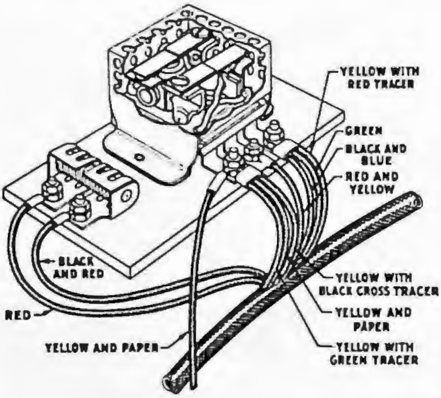
Fig. 3

EQUIPMENT USED

HEYER—111-FORD LABORATORY TEST SET

ABOVE APPLIES TO MODELS:

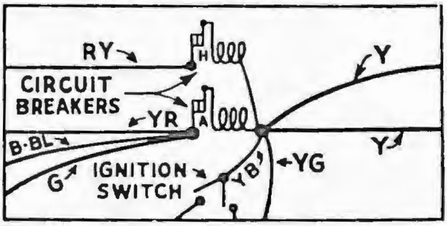
ALL



DOUBLE COMBINATION THERMOSTATIC AND MAGNETIC CIRCUIT BREAKER
Fig. 4

If the short circuit or the cause of the high current still exists the bi-metal again heats and distorts again breaking the circuit. This cycle will continue to be repeated until correction is made.

Starting with 1941 models two of the magnetic and thermostatic circuit breakers in a common case were adopted for all models.



SECTION OF 1941 WIRING DIAGRAM SHOWING DOUBLE CIRCUIT BREAKER
Fig. 5

In cars equipped with the double circuit breaker, the one circuit breaker handles the headlight current and the other the various electrical accessories. By using a double circuit breaker in this manner, a short in the accessory circuits will not affect the lights since the circuits are entirely separate.

Figure 4 illustrates the double circuit breaker as used starting with 1941 models.

Figure 3 is an enlarged section of the wiring diagram for 1940 cars showing the single circuit breaker circuit.

Figure 5 is an enlarged section of the wiring diagram for 1941 cars showing the double circuit breaker circuits.

Automatically, as you increase the volume of your service work, the sale of parts in your service department will proportionately increase. Increased service volume can be realized by the building up of a reputation of doing good work, and by anticipating your customers' needs.

ABOVE APPLIES TO MODELS:	EQUIPMENT USED
ALL	HEYER—HI-FORD LABORATORY TEST SET

April 16, 1941

Printed in U.S.A

Symptom 12999-A

No Spark at Any of the Spark Plug Wires

1. PRELIMINARY INSTRUCTIONS.

Turn the ignition switch on. Hold the end of one spark plug wire $\frac{1}{16}$ inch from the cylinder head while the engine is being cranked. Repeat this procedure in turn at each spark plug wire.

If none of the spark plug wires produce a spark this symptom applies.

If a spark jumps the $\frac{1}{16}$ inch gap from any one or several of the wires, this symptom does not apply.

LINCOLN NOTE: *The Lincoln V-12 engines have two separate 6-cylinder ignition systems (fig. 1), one for each bank of six cylinders. If no spark is obtained at any of the spark plug wires on either bank of cylinders, repeat the following procedures for each. If no spark is obtained from any spark plug wire on but one bank of cylinders, disconnect the battery to coil wire from the coil on the side where a satisfactory spark is obtained and proceed as though it were a 6-cylinder engine.*

When no spark is being delivered at any of the spark plug wires, the engine will not run, and it is evident that something is radically wrong with the circuit. The following procedure is designed to quickly locate the immediate cause of trouble, so that the engine can be started. This procedure does not take into account, nor does it provide correction for any condition that could not account for the immediate trouble.

Schematic drawings of the ignition circuits are shown in the various illustrations under this subject number. The numbers appearing in these drawings are to establish locations in the circuits.

EXAMPLE: *In the following instructions and in the drawings, ⑦ refers to the coil terminal of the battery to coil wire.*

2. PROCEDURE.

Two types of coils have been used. On cars having the coil mounted on the distributor, start procedure with paragraph b below. If a separate coil is used, proceed as follows:

a. Check Coil to Distributor High Tension Wire.

Replace the coil to distributor high tension wire if it has worn or damaged insulation at any point where it passes near metal parts of the engine. Make sure the terminal ⑮ is soldered to the wire and is firmly seated into the coil terminal socket. Make sure the coil to distributor primary wire is making good contact at both ends. If this has not corrected the trouble, proceed as follows:

b. Connect Ammeter from Battery to Coil.

Connect an ammeter between the battery negative terminal ⑪ and the battery terminal of the ignition coil ⑦. Turn the ignition switch off. Crank the engine with the starter, observing the ammeter reading while the engine is cranking, and then follow the procedure for whichever of the following conditions ((1), (2), or (3)) that apply.

(1) *IF THE ENGINE STARTS.* If the engine starts, the trouble is in the primary circuit from the negative (hot) side of the starter relay to the battery terminal of the ignition coil ⑬ to ⑦.

NOTE: *Do not run the engine for more than five minutes with the wires connected in this manner.*

Momentarily disconnect the ammeter lead from the battery ⑪ to stop the engine. If the ammeter now reads zero, crank the engine, a little at a time (with the starter), until a continuous reading is obtained (distributor contacts closed).

Disconnect the ammeter leads from the battery and coil terminals.

Disconnect the battery wire from the coil terminal ⑦.

Turn the ignition switch on.

Connect the ammeter positive lead to the terminal ⑦ of the coil.

Working from the coil toward the battery, contact the ammeter negative lead consecutively to each of the primary circuit terminals ⑦ to ⑪ until an ammeter reading from 3 to 7 amperes is obtained. The faulty part of the circuit is between the terminal where a zero reading was obtained and the terminal where a 3 to 7 ampere reading is obtained.

Remove corrosion, tighten terminals, repair or replace parts at fault.

(2) *IF AMMETER READS ZERO WHEN ENGINE IS CRANKED.* If the ammeter reads zero as the engine is cranked, the trouble is in the primary circuit from the battery terminal ⑦ of the coil to the grounded side ① of the distributor contact points.

Ground the condenser insulated terminal ④, and then follow whichever of the following conditions ((*a*) or (*b*)) that apply:

(a) If Ammeter Still Reads Zero. If the ammeter now reads zero, follow whichever of the following ((*1*) or (*2*)) that apply:

(1) COIL MOUNTED ON DISTRIBUTOR. Replace the coil.

(2) COIL MOUNTED ON CYLINDER HEAD. Make sure the coil to distributor primary wire is not broken and that it is making good contact at both ends ⑦ and ⑧. If the ammeter still reads zero, replace the coil.

(b) If Ammeter Now Reads 7 to 9 Amperes. If the ammeter reads 7 to 9 amperes when the condenser is grounded, the trouble is in the distributor contact points or the primary circuit contact ③ to the breaker arm assembly. Replace or adjust distributor points, or repair primary circuit contact ③.

(3) *IF ENGINE DOES NOT START AND AMMETER READS 7 TO 9 AMPERES.* If the engine does not start and the ammeter reads from 7 to 9 amperes as the engine is cranked, the trouble is in the condenser or the ignition secondary circuit. Follow whichever of the following (*(a)* or *(b)*) that apply:

(a) Coil Mounted on Engine. Tighten the ignition condenser terminal screws ⑤ and ④.

Remove the high tension wire ⑲ from the coil. Connect a jumper wire into the high tension terminal ⑲ of the coil. Hold the other end of this jumper wire $^3/_{16}$ inch from the cylinder head while the engine is cranked with the starter. Observe the quality of the spark from the end of the jumper wire, and follow whichever of the following conditions ((*1*) or (*2*)) that apply:

(1) IF NO SPARK. If there is no spark, remove the condenser for test, or replace it with one known to be good. Again test the quality of the spark, as outlined under *(a)* above. If this has not corrected the trouble, replace the coil.

(2) IF SPARK IS SATISFACTORY. If the spark from the jumper wire is satisfactory, the trouble is a grounded secondary circuit in the distributor rotor or terminal housing assembly. Remove the rotor for test, and replace it if the test indicates high tension circuit leaks externally due to carbon tracks or cracked insulation between the electrode and the distributor shaft. If the rotor is satisfactory, carefully examine the (center) high tension wire socket and rotor contact electrode of the terminal housing for carbon tracks to the distributor housing, due to moisture or foreign matter. Clean the terminal housing with lacquer thinner. Replace the terminal housing if carbon tracks are permanently imbedded into it.

(b) Coil Mounted on Distributor. Remove the condenser for test or replace it with one known to be in good condition. Again attempt to start the engine. If this has not corrected the trouble, remove the coil and clean off any oil or foreign matter from the bottom of the coil with lacquer thinner. Replace the coil if it has any carbon tracks from the secondary contact brush. Test the ignition coil secondary output. If the coil and condenser were both found to be satisfactory, replace the distributor rotor.

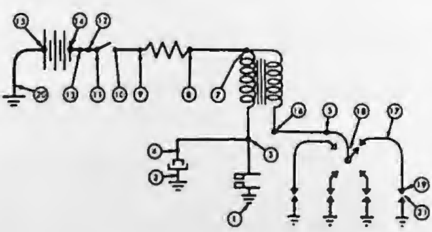


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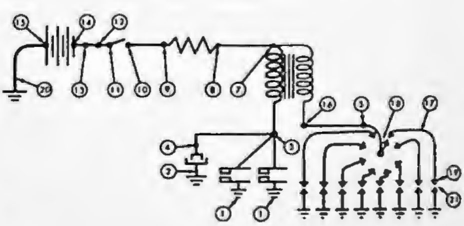
Figure 1—4-Cylinder Ignition



B-190

Figure 2—V-8 Ignition Coil Mounted on Distributor

June 7, 1947

Symptom 12999-B

Satisfactory Spark from Some But Not All Spark Plug Wires

1. PRELIMINARY INSTRUCTIONS.

Test the spark from the end of each spark plug wire at idle speed (500 to 700 RPM) with a gap equivalent to 120 pounds compression. A spark that fails to jump this gap regularly without missing is considered a weak spark.

DEFINITION: *A satisfactory spark is one that will, without missing, regularly jump a spark gap equivalent to the resistance offered by a correctly spaced spark plug under the compression pressure encountered in the operation of the engine.*

LINCOLN NOTE: *The Lincoln V-12 engines have two separate 6-cylinder ignition systems, one for each bank of six cylinders. If the symptom, "a satisfactory spark is obtained from some but not all of the spark plug wires," applies to one bank of cylinders only, the following procedure applies to that bank only. If this symptom applies to both banks of cylinders, repeat the following procedure for each.*

The fact that a satisfactory spark is obtained from some spark plug wires eliminates from consideration those factors that affect equally the output of all of the spark plug wires. These factors are the entire primary circuit, including the contact points, the condenser, and the coil. Likewise, the rotor, as well as the coil to rotor high tension circuit, all of which can be considered as being satisfactory and eliminated from further consideration.

The following procedure takes into account each of the factors that could account for this symptom in the order of their probability.

The numbers appearing in the schematic drawings of the ignition circuits are to establish locations of the terminals referred to in the text.

2. PROCEDURE.

An unsatisfactory spark at some but not all of the spark plug wires indicates faulty insulation or series resistance (air gap) in the high tension circuit.

The distributor ends of the spark plug wires are accessible from the outside of the distributor on some models and not accessible on others and the order of the following instructions should be varied to suit the particular model being worked on.

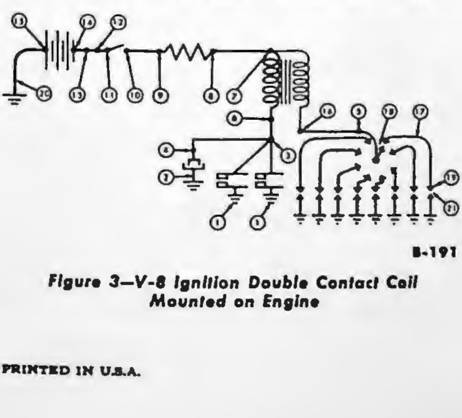
a. Check Spark Plug Wires.

Replace spark plug wires if the insulation is damaged. Make sure all the spark plug wires are soldered to their terminals (17). Make sure the spark plug wire terminals and the terminal sockets are free from corrosion and that the wires are firmly seated into the terminal plate or housing sockets. If the above procedure has not corrected the trouble, proceed as follows:

b. Inspect Terminal Plates.

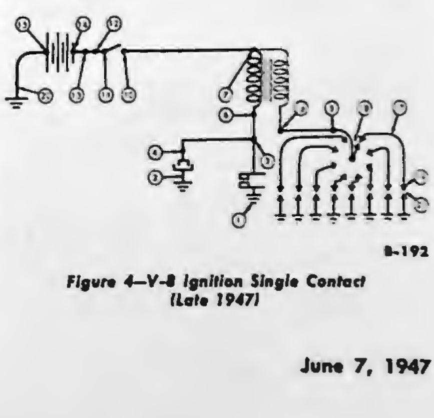
Remove the terminal plates or housing and clean them with lacquer thinner.

If the terminal plates, housing, or rotor electrodes (15) are burned or have carbon tracks from the terminal plate or housing spark plug wire terminal sockets or electrodes (15) to ground, replace the parts at fault. Make sure the wires are firmly seated into the spark plug wire terminal sockets of the terminal plate or housing.



B-191

Figure 3—V-8 Ignition Double Contact Coil Mounted on Engine



B-192

Figure 4—V-8 Ignition Single Contact (Late 1947)

Symptom 12999-C

Intermittent Sparks at All Spark Plugs

1. PRELIMINARY INSTRUCTIONS.

Test the spark from the end of each spark plug wire at idle speed (500 to 700 RPM) with a gap equivalent to 120 pounds compression. A spark that intermittently fails to jump this gap is considered an intermittent spark and the following procedure applies.

When the spark delivered at the end of the spark plug wire is satisfactory but intermittent, the primary ignition circuit is logically given first consideration in the diagnosis procedure. The fact that between "misses" the spark is satisfactory, precludes the possibility that the trouble is in the secondary circuit. The exception would be in relatively rare cases of intermittent break-down of the insulation in the coil, or when moisture, oil, or foreign matter are allowed to accumulate in sufficient quantities on the distributor terminal plates, housings, or distributor rotor to conduct high tension circuit intermittently to ground.

The terminal numbers in the text refer to the numbered terminals in the schematic ignition circuits.

LINCOLN NOTE: *The Lincoln V-12 engines have two separate 6-cylinder ignition systems (fig. 1). If the missing occurs on one bank of cylinders only, apply the following procedure to that portion of the ignition system only. If the missing occurs at both banks of cylinders, repeat the following procedures for each.*

2. PROCEDURE.

a. Tighten Connections.

Tighten all connections in the primary circuit, including both terminals of the condenser ③ and ④ and both ends of both battery cables ⑬, ⑭, ⑫ and ⑳.

NOTE: *On models equipped with an external ballast resistance unit, due to the expansion and contraction as a result of the heating and cooling, the resistance unit terminals Nos. ⑧ and ⑨ sometimes have a tendency to loosen.*

On cars having the coil mounted on the cylinder head, make sure the coil to distributor high tension wire terminal ⑮ is soldered to the wire and seated all the way into the high tension terminal of the coil.

If the above has not corrected the trouble, proceed as follows:

b. Adjust or Replace Contact Points.

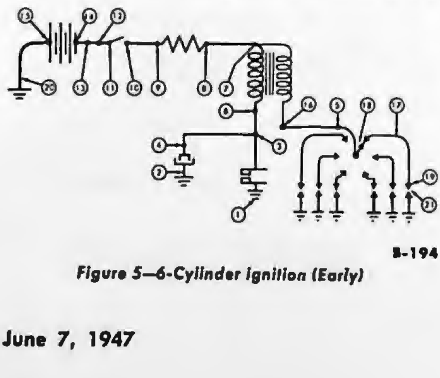
Replace and/or respace the distributor contact points, if required, making sure the breaker arm is not binding on its bearing. Make sure the spring tension is within the specified limits (Subject 12000).

Reset the timing, and again test the quality of the spark. If the spark is still intermittent, proceed with subparagraph c. below.

c. Test Coil and Condenser.

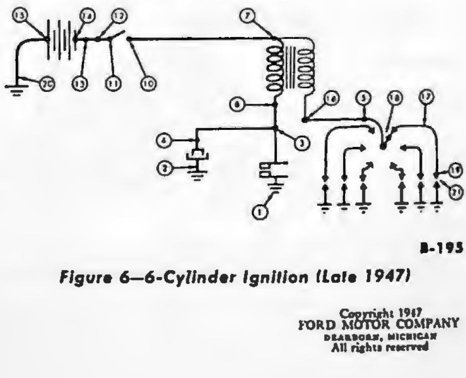
Test the coil output. Test the condenser capacity, leakage, and series resistance. If the coil and condenser were both found to be satisfactory, examine the terminal plates, housing, and rotor for moisture, oil, or foreign matter in small quantities which might cause an intermittent leak of high tension current to ground. Clean any of the parts in question with lacquer thinner, replace the parts having carbon runs imbedded into the surface.

NOTE: *A distributor just starting to short through to the distributor shaft could cause an occasional miss under load. Eventually such a rotor (if left in service) would short each spark.*



B-194

Figure 5—6-Cylinder Ignition (Early)



B-195

Figure 6—6-Cylinder Ignition (Late 1947)

June 7, 1947

Symptom 12999-D

Weak Spark at All Spark Plug Wires

1. PRELIMINARY.

With the engine idling (500 to 700 RPM) test the quality of the spark from the end of each spark plug wire. On all Ford, Lincoln, and Mercury engines the spark should jump a gap equal to 120 pounds compression. If the spark jumps this gap regularly without missing, it is satisfactory. If a satisfactory spark is obtained from some but not all spark plug wires refer to symptom 12999-B. The following procedure applies only where a weak spark is obtained from all of the spark plug wires.

LINCOLN NOTE: *The Lincoln V-12 engines have two separate 6-cylinder ignition systems which are considered separately in the following instruction. This symptom applies where a weak spark is obtained from all of the spark plug wires of one or both of these separate 6-cylinder ignition systems.*

A weak spark at all of the spark plug wires can only be the result of trouble in some unit or units that have an equal effect at all of the spark plug wires. The entire primary circuit including the contact points has an equal effect at all spark plug wires. Likewise, the condenser, coil, and distributor rotor and the rotor gap have an equal effect at all spark plug wires. On cars having the coil mounted on the cylinder head, the high tension wire from the coil to the distributor also can influence the output of all of the spark plug wires. These represent the probable causes of a weak spark.

It is possible for all of the spark plug wires or all of the terminal plate terminals to leak, however, this is considered unlikely and for this reason in the following procedure the more probable causes are considered first in the order of their accessibility.

2. PROCEDURE.

Since the ignition secondary output is dependent on the primary voltage the condition or state of charge of the battery is an important consideration. If the battery will not crank the engine, recharge or replace the battery.

a. Remove any Excessive Resistance on Primary.

The ignition primary circuit is tested in two steps as follows:

(1) *TEST DISTRIBUTOR CONTACT DWELL.* Measure the contact point dwell with either the "Ford Diagnosis Test Set" or the "Ford Laboratory Test Set."

Correct distributor contact dwell is as follows:

Distributor	Dwell Per Cent	
	Minimum	Maximum
9N-12100	37	42
40-12127-A	77	82
40-12127-B	77	82
68-12127	77	82
78-12127	77	82
11A-12127	77	82
21A-12127	77	82
5GA-12127	57	62
1GA-12127	57	62
59A-12127	77	82
16H-12127 (each)	57	62
7RA-12127-B	61	66
7HA-12127-B	57	60

If contact point dwell is within the above limits, proceed with subparagraph (2) below.

If dwell is not within these limits, replace contact points that are visibly burned or pitted and/or adjust contact points to obtain the correct dwell.

(2) *TEST RESISTANCE BATTERY TO COIL.*

NOTE: *Since the output of the ignition secondary circuit is limited by the strength of the primary circuit, any extra resistance in the primary circuit will reduce the output.*

Disconnect the battery wire from the coil ① and install an ammeter in series at this point.

Connect a voltmeter from the battery negative terminal to ground.

Turn the ignition switch on. If no ammeter reading is obtained, crank the engine slightly to close the distributor points (an amperage reading is only possible when contacts are closed).

Divide the voltage reading by the amperage reading to determine total resistance of the primary circuit.

EXAMPLE: *6.2 volts divided by 5.2 amperes, equals 1.19 ohms.*

Total resistance of the ignition primary circuit is normally 1.1 ohms cold or 1.4 ohms when hot.

If the resistance of the primary circuit is higher than normal, leave the ammeter connected in series and connect the voltmeter parallel in turn to each of the units in the circuit.

Normal resistance of the individual units is:

Unit	Resistance (Ohms) Hot	Cold
Ignition switch	0.02	0.02
Resistance unit	0.56	0.35
Bakelite case ignition coil (primary)	0.60	0.50
Metal case ignition coil (primary)	0.31	1.15

Replace units having high resistance.

If the above has not corrected the trouble, proceed as follows:

b. Test Coil, Condenser, and Contact Points.

Two methods of mounting the coil have been used. Follow whichever of the following procedures ((1) or (2)) that apply:

(1) *COIL MOUNTED ON DISTRIBUTOR.* Remove and test the coil and the condenser.

If the output of coil is unsatisfactory, substitute a condenser known to be good and repeat the test.

If the coil output is still unsatisfactory replace the coil.

If the coil output is satisfactory, visually examine the distributor contact points and replace or adjust them on the distributor stroboscope, if required. Clean the distributor terminal plate and rotor with lacquer thinner. Replace these parts if any carbon tracks are visible or if electrodes have eroded to the extent that the rotor gap has been increased.

Replace the rotor if there is any indication that it is shorted through to the distributor shaft.

Replace the rotor contact brush if it is broken or worn.

Make sure all high tension wire terminals are soldered to the wires and that their terminal sockets are free from corrosion.

Install the various parts removed, making sure each high tension wire is firmly seated in its terminal socket.

(2) *COIL MOUNTED ON CYLINDER HEAD.* Coils mounted on the cylinder head can be tested without removal as follows:

(a) TEST COIL AND CONDENSER. Remove the high tension wire from the coil and install a 12-inch long jumper wire in its place. Turn the ignition switch on. Hold the end of this jumper wire 3/16 inch from the cylinder head while the engine is being cranked. Follow whichever of the following ((1) or (2)) that apply:

(1) SPARK JUMPS 3/16-INCH GAP. If the spark jumps this gap regularly, both the coil and condenser are satisfactory, proceed with subparagraph *(b)* below.

(2) SPARK DOES NOT JUMP 3/16-INCH GAP. If the spark fails to jump a 3/16-inch gap, replace the condenser with one known to be good. If the spark is now satisfactory, the trouble has been corrected. If the spark still fails to jump this gap, remove and test the ignition coil output on the distributor stroboscope. If this test reveals the coil to be unsatisfactory, replace the coil. If this test reveals the coil to be satisfactory, proceed with subparagraph *(c)* below.

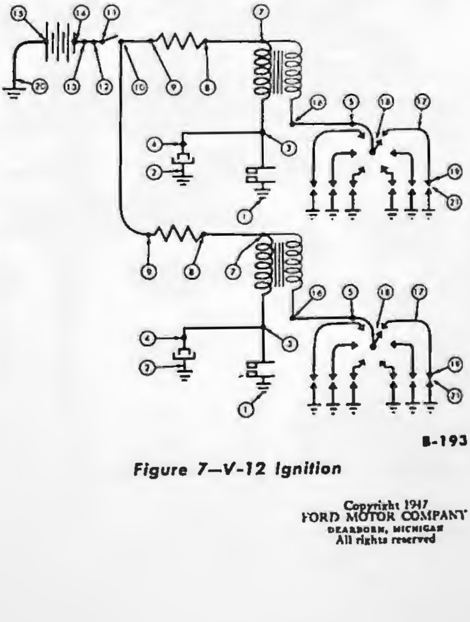
(b) REMOVE RESISTANCE IN HIGH TENSION CIRCUIT. Clean the distributor terminal plate and rotor with lacquer thinner. Replace these parts if any carbon tracks are visible or if the electrodes have eroded to the extent that the rotor gap has been increased.

Replace the rotor if there is any indication that it shorts through to the distributor shaft under load.

Replace the rotor contact brush if it is broken or worn.

Make sure all high tension wire terminals are soldered to the wires and that their terminal sockets are free from corrosion.

(c) ADJUST OR REPLACE CONTACT POINTS. Replace the distributor contact points if they are burned or misaligned. Establish the correct dwell on the distributor stroboscope. Reset the distributor timing.



B-193

Figure 7—V-12 Ignition

June 7, 1947

HEADLIGHTS

FORD	PASSENGER CAR		TRUCKS	
Year	Headlight Height (Inches)	Center Line of Car to Headlight (Inches)	Headlight Height (Inches)	Center Line of Car to Headlight (Inches)
1932	39	14	39	14
1933	39	16½	39	15½
1934	35	16½	36	15½
1935	35½	17⅜	36	19½
1936 (3-pass.)	34	17⅜		
1936 (5-pass.)	34	16½	43¼	19½
1937	30¼	16½		
1937 (Model 79)			40	19½
1937 (Model 77-87)			35	19½
1938	31	16½	34¾	19½
1939	31	24	40½	19½
1940	30¼	24	37½	19½
1941	32	22¾	32	19¾
1942-47	37½	22¾	37½	19¾
1938-42 (C.O.E.)			34¾	27½
1946-47 (C.O.E.)			37½	27½
1948	37½	22¾		
1949	32⅞	26¾		
F-1 (6.50-16)			30⅛	19⅞
F-2 (7.50-16)			32	19⅞
F-3 (7.00-17)			32	19⅞
F-4 (7.00-18)			34½	19⅞
F-5-6 (7.50-20)			36	19⅞
F-7 (9.00-20)			39	24⅞
F-8 (10.00-20)			39½	24⅞
F-5-6 (C.O.E.) (7.50-20)			35½	24⅞
	MERCURY		LINCOLN-ZEPHYR	
1936-37			33	25½
1938			30¾	26½
1939	40½	24	30¾	26½
1940	37½	24	30	26½
1941	32	24	30	26½
1942-48	37½	27⅛	30½	23⅞
1949	30⅜	28¼		
1949 8H			31¼	25½
1949 8L			32	25½

13007—HEADLIGHT BULBS

Part Number	Type	Candle Power	Watts	Volts
B-13007-C	Two Filament	32-32	—	6
48-13007	Two Filament	32-32	40-30	6
48-14007-B	Two Filament	21-21	—	6
09A-13007	Sealed Beam	—	45-35	6
09B-13007-A	Two Filament	32-32	—	12
09B-13007-B	Two Filament	21-21	—	12
8MB-13007	Sealed Beam	—	45-35	12

13465-15021—GENERAL PURPOSE BULBS

Part Number	Used For	Contact	C.P.	Volts
B-13465	Stop, Rear, Backup	Single	21	6
40-13465	Stop, Rear	Double	21-3	6
11A-13465	Park, Turn Ind., Stop, Rear	Double	21-3	6
09B-13465-B	Stop, Deck, Spot	Single	3	6
B-13466	Dome, Inst. Panel, License Plate, Deck, Rear, Stop Spot	Single	3	6
78-13466	Inst., Clock, Park, Turn Ind., Ignition Lock, Hand Brake Signal	Single	2	6
09B-13466-A	Rear, Park, Beam Ind., Deck, Speedometer	Double	3	12
09B-13466-B	Rear, Beam Ind., Stop, Sign	Double	3	12
19B-13466	Beam Ind., Inst. Panel, Rear, Pressure, Rear Door	Single	1.5	12
48-15021	Beam Ind., Turn Ind.,	Single	1	
B-13799	Utility, Dome, Eng. Comp.	Single	15	6.75
8M-15330	Spot	–	–	–
8A-13464	Courtesy, Glove Compt., Dome	Double	6	–
40-13730	Dome	Single	6	6.5

13832-13833—HORN ASSEMBLY

Part Number				One Horn	Two Horns
11A-13832-A,B	H.P.*	11A-13833-B,C	L.P.**	6-8	12-16
48-13832-B,C	H.P.*	48-13833-A,C	L.P.**	6-8	12-16
70-13832	H.P.*	70-13833-B	L.P.**	6-8	12-16
78-13832	L.P.**	78-13833	H.P.*	6-8	12-16
81A-13832-A,B	H.P.*	81A-13833-B	L.P.**	6-8	12-16
91A-13832	H.P.*	91A-13833	L.P.**	6-8	12-16
09B-13832	H.P.*	09B-13833	L.P.**	6-8	12-16
1GA-13832-B	H.P.*	1GA-13833-B	L.P.**	6-8	12-16
H-13832	L.P.**	H-13833	H.P.*	–	24-28
HB-13832	H.P.*	HB-13833	L.P.**	–	24-28
86H-13832	H.P.*	86H-13833	L.P.**	–	24-28
06H-13832	H.P.*	06H-13833	L.P.**	–	24-28
26H-13832	H.P.*	26H-13833	L.P.**	–	24-28
8C-13832	H.P.*	8C-13833	L.P.**	6-8	12-16
51A-13832-A,B	H.P.*	51A-13833-A,B	L.P.**	–	24-28
59B-13832	H.P.*	59B-13833	L.P.**	6-8	12-16
01T-13833				6-8	
7RC-13833				6-8	
01TS-13833				6-8	

*Indicates high pitch
**Indicates low pitch

June 9, 1948

Symptom 14999-A

Entire Electrical System Inoperative

a. Procedure.

As is true in diagnosing any trouble, what the owner states is wrong merely reflects his impression. For this reason the first step in trouble shooting is to establish the facts, making the necessary correction where the fault is found before proceeding with the next step.

A quick analysis of the entire electrical system to isolate individual circuits causing trouble is made by determining if current is available at various points in the main circuit. These tests are all made without leaving the driver's seat and no equipment is required. Four operations and an observance of what occurs during each are involved as follows:

(1) Press horn button (momentarily).

(2) Press starter button (momentarily).

(3) Turn ignition switch on (15 seconds).

(4) Turn pillar lights on (momentarily).

NOTE: *If vehicle is not equipped with pillar lights, turn on headlights.*

b. Diagnosis.

Based on your observations during the above tests, follow whichever of the following (1) through (9) that applies:

(1) *HORN SOUNDS.* If the horn sounds, the battery and the battery cables are OK.

(2) *HORN DOESN'T SOUND.* If the horn does not sound and if paragraphs (3), (5), (7), and (8) below are true, the trouble is in the horn circuit, follow symptom 14999-N.

(3) *STARTER ENGAGES.* If the starter engages, battery, cables and starter relay are OK.

(4) *STARTER DOESN'T ENGAGE.* If the starter does not engage, but the horn does sound, follow procedure for Symptom 11999-A.

(5) *INSTRUMENTS REGISTER.* If the instruments register, battery cables, and the circuit to the overload circuit breaker are OK.

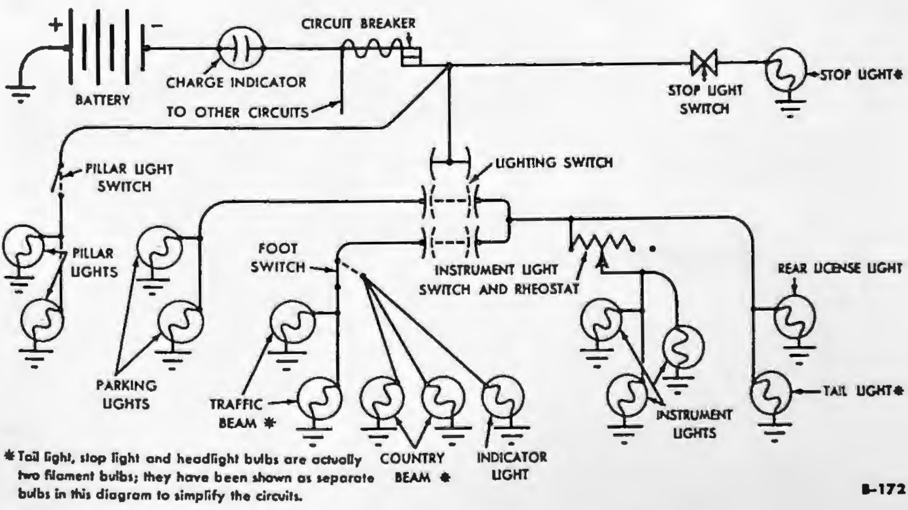


Fig. 1—Light Circuit with Single Circuit Breaker

(6) *NO INSTRUMENTS REGISTER.* If none of the instruments register and the lights do not light, the trouble is in the wire running from the starter relay to the circuit breaker. If none of the instruments register but the lights light, the trouble is in the ignition switch or main feed wire to the instruments.

(7) *SOME BUT NOT ALL OF INSTRUMENTS REGISTER.* If some but not all of the instruments register, follow the procedure for Symptoms 14999-V, W, X, Y, or Z.

(8) *LIGHTS LIGHT.* If pillar (or head) lights light, battery, cables, circuit to overload circuit breaker and the circuit breaker are OK.

(9) *LIGHTS DO NOT LIGHT.* If the lights do not light, the battery cable is loose or the main feed wire is disconnected at the switch or headlight loom or the wire is broken.

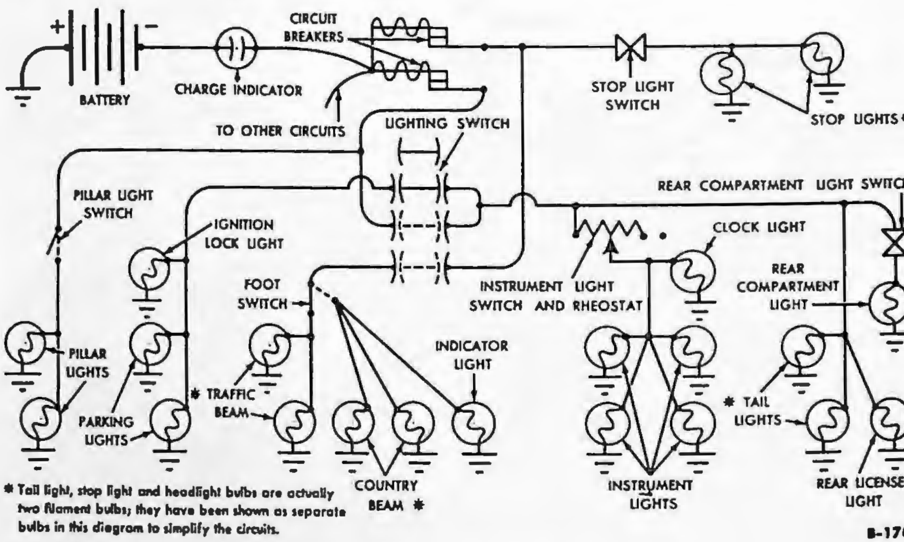


Fig. 2—Light Circuit with Double Circuit Breaker

Symptom 14999-B

Headlights Flicker From Bright to Dim

If all lights flicker from bright to very dim, the overload circuit breaker is operating as a result of a grounded or shorted wire in that particular circuit. Set the headlight switch to headlight position. Observe the reaction as you switch from high to low beam with the beam control switch. Follow (1), (2), or (3) below, whichever applies. If the lights flicker when on low beam, the short is in that circuit, likewise, the short would be in the high beam circuit if the high beam lights are on.

(1) *UPPER BEAM ONLY FLICKERS.* If the lights flicker only when the beam control switch is in the upper beam position, the "short" is in the upper beam circuit from the beam control switch to the headlights.

(2) *LOWER BEAM ONLY FLICKERS.* If the lights flicker only when the beam control switch is in the lower beam position, the "short" is in the lower beam circuit from the beam control switch to the headlights.

(3) *BOTH BEAMS FLICKER.* If the lights flicker in both high or low beam, set the headlight switch to the parking light position. Follow *(a)* or *(b)* below, whichever applies.

(a) LIGHTS STILL FLICKER. If the lights still flicker, a short exists in the taillight circuit.

(b) LIGHTS NO LONGER FLICKER. If the lights no longer flicker, a short exists between the headlight switch and the beam control switch.

Symptom 14999-C

Individual Lights Do Not Light

When one or several lights do not light and other lights do, the fault usually is in the bulb itself. However, some light bulbs are easily replaced while others present more difficulty. The ease with which the particular bulb can be replaced determines the order of procedure. Follow (1) or (2) below, whichever applies.

NOTE: *If the bulbs burn out repeatedly, it is probably due to the voltage being too high. Check the generator voltage and make repairs or adjustments as required.*

(1) *BULB READILY ACCESSIBLE.* Replace the bulb. If this does not correct the trouble, proceed as outlined in paragraph (2) below.

(2) *BULB DIFFICULT TO REPLACE.* Turn the lights on. Disconnect the wire at the bullet connector nearest to the bulb and momentarily ground the "hot" wire. Follow *(a)* or *(b)* below, whichever applies.

(a) SPARK OCCURS. If a spark occurs, connect the wire and replace the bulb or any wiring that runs from that point to the bulb.

(b) NO SPARK OCCURS. If no spark occurs, an open circuit exists between the point that was grounded and the light switch. Make necessary repairs.

Symptom 14999-D

One or More Lights Burn Out Repeatedly

Lights burn out prematurely because of either high voltage or excessive vibration. The normal life of a bulb at a given voltage is shown below.

Voltage at Source	Approximate Life (Hours)
5.7	7800
5.9	5060
6.1	3300
6.3	2060
6.5	1425
6.7	1010
6.9	645
7.1	460
7.3	322

Voltage at Source	Approximate Life (Hours)
7.5	230
7.7	160
7.9	115
8.1	87
8.3	60

a. Procedure.

Clean and tighten all electrical connections in the circuit involved, including the battery cable connections. Test the generator voltage regulation and adjust or replace the regulator if required, Opr. 10505-D.

Alignment of the headlights should be checked after every minor collision to make sure they are still safe.

July 17, 1947

Symptom 14999-N

Horn Will Not Sound

In some cases the horn may have been disconnected by someone without the owner's knowledge. The following procedure takes this possibility into account.

a. Procedure.

Reconnect any wires that may have been disconnected at either the horn relay or the bottom of the steering column and follow (1) or (2) below, whichever applies.

(1) *HORN SOUNDS.* If the horn sounds when connecting the wires, follow the procedure outlined in Symptom 14999-O.

(2) *HORN DOES NOT SOUND.* If the horn does not sound when all of the wires are connected, press the horn button. If the horn still does not sound, disconnect the main feed wire at the horn relay (fig. 1) and ground it momentarily and follow *(a)* or *(b)* below, whichever applies.

(a) Spark Occurs. If spark occurs, the wire can be considered satisfactory. Connect one end of a jumper wire to the main feed wire. Momentarily contact the other end of the jumper wire to each horn wire, if each horn sounds, replace the horn relay. If the horns do not sound, repair or replace the horns.

(b) No Spark Occurs. If no spark occurs, an open circuit exists between the end of the wire that was grounded and the starter relay. Make the repairs as required.

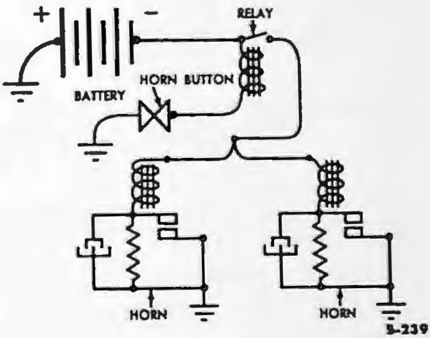


Fig. 1—Horn Circuit

Symptom 14999-O

Horn Sounds Continuously

a. To Stop the Noise.

To stop the horn from sounding, disconnect the horn button wire from the bullet connection at the lower end of the steering column or at the horn relay, whichever is the more accessible. If the horn continues to sound, disconnect the horn wires from the horn relay.

b. Correction.

If, when stopping the horn from sounding, it stopped when the horn button wire was disconnected, the trouble is in the horn button wire or horn button. Repair or replace whichever is at fault. If the horn continued to sound after the horn button wire was disconnected, the trouble is in the relay or the wire between the bullet connection and relay. Repair the wire or replace the relay, whichever is required.

The warning signal of the horns plus good brakes and properly aligned lights make for a safe car.

December 7, 1947

Symptom 14999-V

Charge Indicator (Ammeter) Inoperative

Turn the headlights on and follow whichever of the following (1) or (2) that applies.

(1) If the ammeter does not show a discharge, replace the ammeter.

(2) If the ammeter shows a discharge, the trouble (if any) is in the generating system (see Subject 10999).

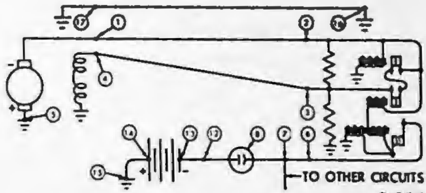


Fig. 1—Generating Circuit with Charge Indicator (Ammeter)

Symptom 14999-W

Battery Gauge (Voltmeter) Does Not Register Correctly

The colors on the car instrument indicate the following voltages:

Marking	Voltage
Red	Up to 6.2
Orange	6.2 to 7.1
Green	7.1 to 8.5
Red	8.5 and above

Connect a master voltmeter parallel to the battery gauge in the car. Run the engine at approximately 1500 R.P.M. and compare the reading of both meters.

Replace the instrument if its indicator hand does not indicate the proper voltage.

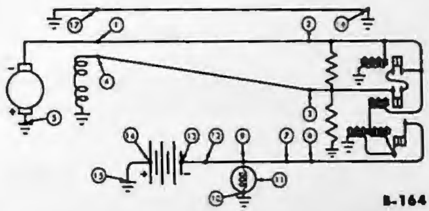


Fig. 2—Generating Circuit with Battery Gauge (Voltmeter) in Circuit

Symptom 14999-X

Fuel Gauge Inoperative

Turn the ignition switch ON and observe the fuel gauge. Follow (1) or (2) below, whichever applies.

(1) *GAUGE READS OVER THE FULL MARK.* If the indicator hand goes beyond the scale on the opposite side of the gauge, a wire in the fuel gauge circuit is shorted (grounded), repair or replace the wire.

(2) *GAUGE READS LESS THAN FULL.* If the gauge reads less than full or fails to register, momentarily short the fuel gauge (yellow) wire to ground with a jumper wire until the needle reaches the highest reading on the gauge, then immediately remove the grounded wire. Follow *(a)* or *(b)*, whichever applies.

WARNING: *Leaving the wire grounded after the maximum reading is obtained is likely to result in damage to the gauge.*

(a) Gauge Reads Full. If the needle reaches the maximum travel on the scale when the wire is grounded, the fuel tank unit or the wire connecting the fuel tank unit and gauge is at fault. Make the necessary repairs.

(b) Gauge Fails to Read. If the gauge on the instrument panel does not register when the wire is grounded, replace the gauge.

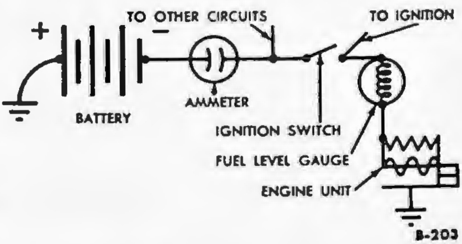


Fig. 3—Fuel Gauge Circuit

July 17, 1947

Symptom 14999-Y

Oil Pressure Gauge Inoperative

Turn the ignition switch ON, and observe the oil pressure gauge. Follow (1) or (2) below, whichever applies.

(1) *GAUGE READS BEYOND HIGHEST READING.* If the indicator hand goes beyond the scale on the opposite side of the gauge, a wire from the dash unit to the engine unit in the oil gauge circuit is shorted (grounded), repair or replace the wire.

(2) *GAUGE READS LOW.* Connect a jumper wire to the black and yellow wire at the oil pressure gauge terminal. Momentarily touch the jumper wire to ground until the needle reaches the highest reading on the scale, then immediately remove the jumper wire.

WARNING: *Leaving the wire grounded after the maximum reading is obtained is likely to result in damage to the gauge. If the gauge on the instrument panel does not register when the jumper wire is grounded, replace the gauge.*

If the needle reaches the maximum travel on the scale when the wire is grounded, the engine unit or the oil pressure itself is at fault. Make the necessary repairs.

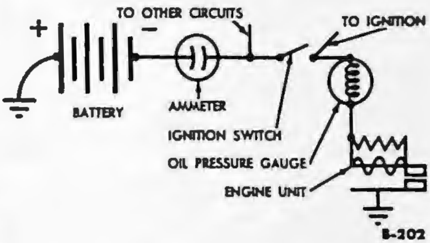


Fig. 4—Oil Pressure Gauge Circuit

Symptom 14999-Z

Temperature Gauge Incorrect

The first step in trouble shooting for the above symptom is to determine whether the dash unit or the engine units are at fault. The principles on which the Electric Temperature Gauge operates are described in Bulletin Subject 10883, page No. 3.

1. PROCEDURE

a. Indicator at the C Position (Switch Off).

This symptom indicates a defective dash unit.

(1) Replace the dash unit. Make sure a short does not exist in the gauge circuit before installing a replacement dash unit.

b. Indicator at the C Position All the Time (Switch On).

This symptom indicates a short in the gauge circuit or a defective dash unit.

(1) Disconnect the wire leading to the engine unit at the terminal on the dash unit. Turn on the switch. If the indicator remains at C position, replace the dash unit. If the indicator moves toward the H position, a short exists in the wiring from the dash unit to the engine units, or one of the engine units is shorted. To determine where the fault lies, proceed as follows:

(2) Connect the wire at the dash unit, and disconnect the wire at the LEFT engine unit. Do not ground. Turn on the switch. If the indicator registers at the C position, a short exists in the wiring between the LEFT engine unit and the dash unit. Repair or replace the wiring. If the indicator moves toward the H position, the short is in one or the other engine units,

or their connecting wire. Follow the procedure under (3) below.

(3) Connect the wire leading from the dash unit at the LEFT engine unit. Disconnect the other wire at the LEFT unit. Do not ground. Turn on the switch. If the indicator remains at the C position, the LEFT engine unit is grounded. Replace the defective unit. If the indicator moves toward the H position, the fault lies in the RIGHT engine unit or connecting wire. Follow the procedure under (4) below.

(4) Connect the wire between the engine units to the LEFT engine unit and disconnect the other end at the RIGHT unit. Do not ground. Turn on the switch. If the indicator remains at the C position, a short exists in the wire between the engine units. Replace the defective wire. If the indicator moves toward the H position, the fault lies in the RIGHT engine unit. Replace the unit.

c. Indicator at the H Position (Switch Off).

The gauge is so designed that with no current flowing through the dash unit, the indicator remains at the H position.

d. Indicator at the H Position (Switch On) All the Time.

(1) Turn on the switch. Observe the gas and oil dash units. If they are inoperative, correct the power supply circuit from the ignition switch to the dash instruments. If the gas and oil dash units are operative, follow the procedure under (2) below.

(2) Turn on the switch. Momentarily short the wire leading from the dash unit to the engine unit at the dash unit terminal. If the indicator remains at the H position, replace the dash unit. If the indicator moves toward the C position, an open circuit is indicated, follow the procedure under (3) below.

(3) Disconnect the wire leading from the dash unit at the LEFT engine unit. Turn on the switch. Momentarily short the wire. If the indicator remains at the H position, an open circuit exists in the wire leading from the dash unit to the engine unit. Repair or replace the wire. If the indicator moves toward the C position, follow the procedure under (4) below.

(4) Turn on the switch. Momentarily ground the LEFT engine unit terminal leading to the RIGHT unit. If the indicator remains at the H position, the LEFT engine unit is defective, replace the unit. If the indicator moves toward the C position, follow the procedure under (5) below.

(5) With the switch on, momentarily short the terminal of the RIGHT engine unit. If the indicator remains at the H position, the wire between the engine units is open. Repair or replace the wire. If the indicator moves toward the C position, the RIGHT engine unit is defective. Replace the unit.

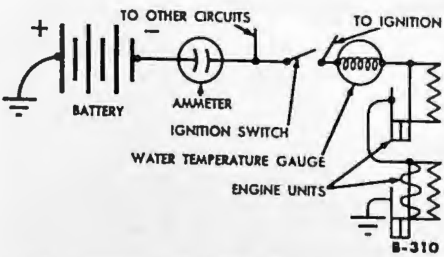


Fig. 1—Temperature Gauge Circuit (Dual Engine Unit)

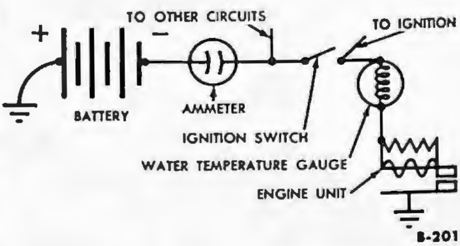


Fig. 2—Temperature Gauge Circuit (Single Engine Unit)

March 8, 1948

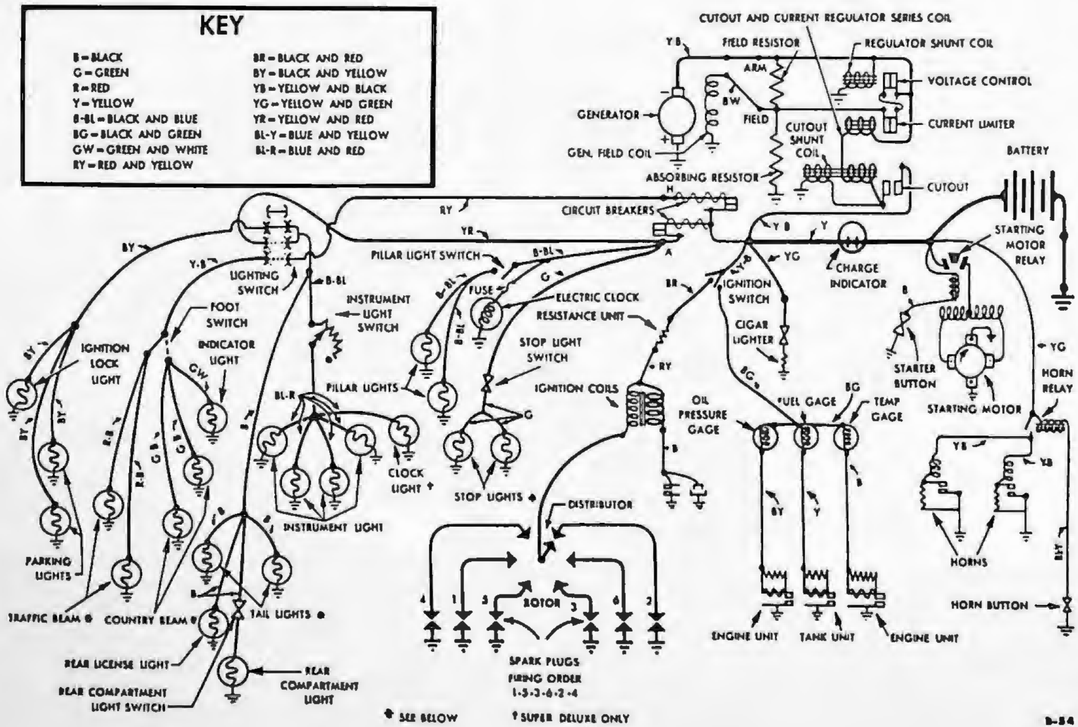


Figure 1—Simplified Wiring Diagram of 6 Cyl. Car, 1945-7

●Taillight, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

1945-7, 6 CYL. CAR

May 17, 1947

1945-7, 6 CYL. CAR

May 17, 1947

KEY

CIRCUITS	COLOR	SIZE
PARKING LIGHT FROM SWITCH	Black and Yellow	16
HEADLIGHTS (COUNTRY BEAM) FROM BEAM CONTROL SWITCH	Green with Black Tracer	14
HEADLIGHTS (TRAFFIC BEAM) FROM BEAM CONTROL SWITCH	Red with Black Tracer	14
INSTRUMENT LIGHTS FROM RHEOSTAT	Blue with Red Tracer	16
INSTRUMENT LIGHT RHEOSTAT FROM LIGHT SWITCH	Black with Blue Tracer	16
TAIL, LICENSE, AND REAR COMPARTMENT LIGHTS FROM SWITCH	Black	14
STOP LIGHT	Green	14
PILLAR LIGHTS	Black with Blue Tracer	16
MAIN LIGHT CIRCUIT FROM CIRCUIT BREAKER	Red with Yellow Tracer	12
PARKING LIGHT CIRCUIT FROM CIRCUIT BREAKER	Yellow with Red Tracer	12
CLOCK FROM PILLAR LIGHT CIRCUIT	Yellow with Black Tracer	18
IGNITION SWITCH FROM CIRCUIT BREAKER	Yellow with Black Tracer	14
IGNITION SWITCH TO RESISTOR	Black and Red	16
IGNITION COIL FROM RESISTANCE	Red	16
GAGES FROM IGNITION SWITCH	Black and Green	16
OIL GAGE (ENGINE UNIT) FROM PANEL GAGE	Black and Yellow	16
TEMPERATURE GAGE (ENGINE UNIT) FROM PANEL GAGE	Black	16
FUEL GAGE (TANK UNIT) FROM PANEL GAGE	Yellow	16
GENERATOR ARMATURE	Yellow with Black Tracer	10
CIRCUIT BREAKER TO STARTING MOTOR RELAY	Yellow	10
STARTING MOTOR	Black	1
HORN RELAY FROM STARTING MOTOR	Yellow with Green Tracer	10
HORN BUTTON FROM HORN RELAY	Blue with Yellow Tracer	14
HORN FROM RELAY	Yellow with Green Tracer	14

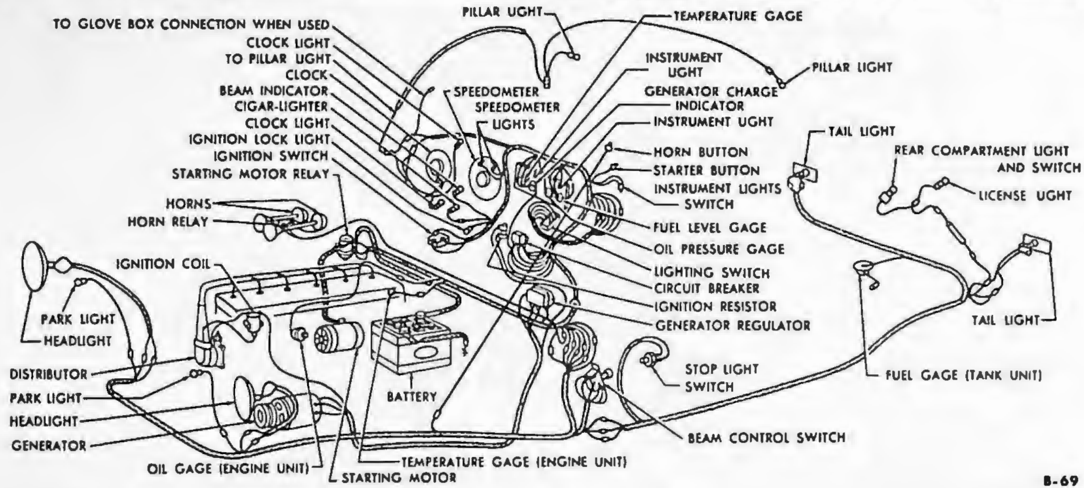


Figure 2—6 Cyl. Car Electrical System, 1945-7

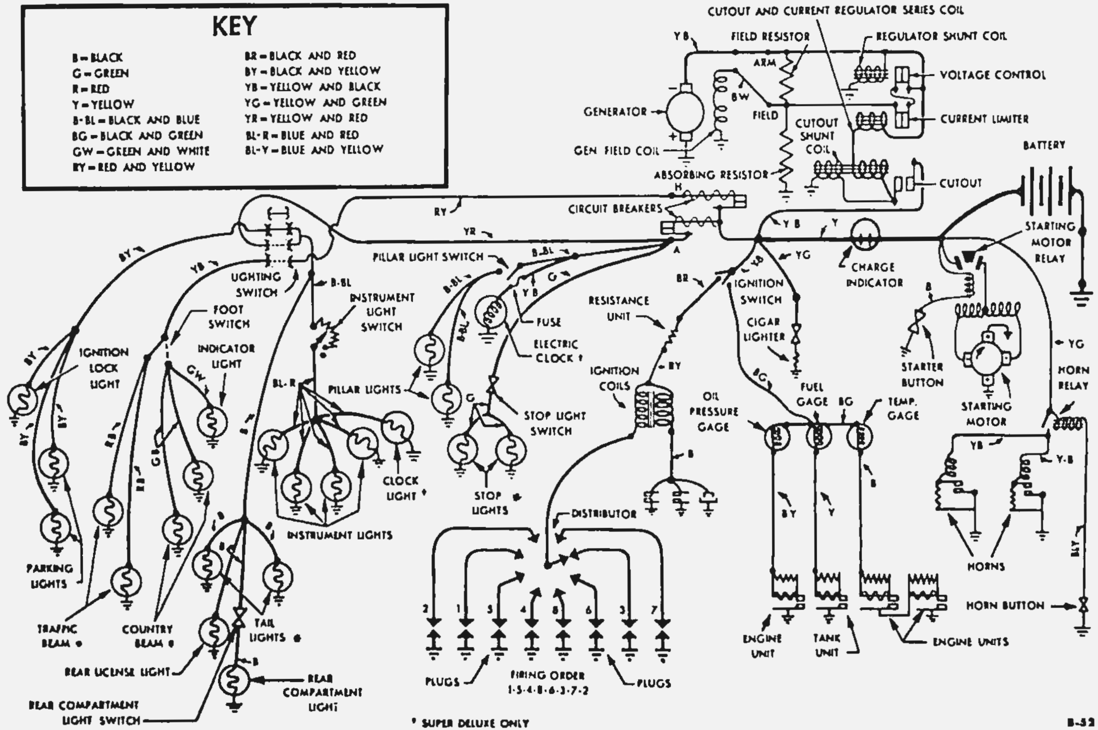


Figure 1—Simplified Wiring Diagram of De Luxe and Super De Luxe Ford V-8, 1945-7

***Taillight, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.**

KEY

CIRCUITS	COLOR	SIZE
PARKING LIGHT FROM SWITCH	Black and Yellow	16
HEADLIGHTS (COUNTRY BEAM) FROM BEAM CONTROL SWITCH	Green with Black Tracer	14
HEADLIGHTS (TRAFFIC BEAM) FROM BEAM CONTROL SWITCH	Red with Black Tracer	14
INSTRUMENT LIGHTS FROM RHEOSTAT	Blue with Red Tracer	16
INSTRUMENT LIGHT RHEOSTAT FROM LIGHT SWITCH	Black with Blue Tracer	16
TAIL, LICENSE, AND REAR COMPARTMENT LAMPS FROM SWITCH	Black	14
STOP LIGHT	Green	14
PILLAR LIGHTS	Black with Blue Tracer	16
MAIN LIGHT CIRCUIT FROM CIRCUIT BREAKER	Red with Yellow Tracer	12
PARKING LIGHT CIRCUIT FROM CIRCUIT BREAKER	Yellow with Red Tracer	12

CIRCUITS	COLOR	SIZE
CLOCK FROM PILLAR LIGHT CIRCUIT	Yellow with Black Tracer	18
IGNITION SWITCH FROM CIRCUIT BREAKER	Yellow with Black Tracer	14
IGNITION SWITCH TO RESISTOR	Black and Red	16
IGNITION COIL FROM RESISTANCE	Red	16
GAGES FROM IGNITION SWITCH	Black and Green	16
OIL GAGE (ENGINE UNIT) FROM PANEL GAGE	Black and Yellow	16
TEMPERATURE GAGE (ENGINE UNIT) FROM PANEL GAGE	Black	16
FUEL GAGE (TANK UNIT) FROM PANEL GAGE	Yellow	16
GENERATOR ARMATURE	Yellow with Black Tracer	10
CIRCUIT BREAKER TO STARTING MOTOR RELAY	Yellow	10
STARTING MOTOR RELAY FROM SWITCH RELAY	Black	16
HORN RELAY FROM STARTING MOTOR	Yellow with Green Tracer	10
HORN BUTTON FROM HORN RELAY	Blue with Yellow Tracer	14
HORN FROM RELAY	Yellow with Green Tracer	14

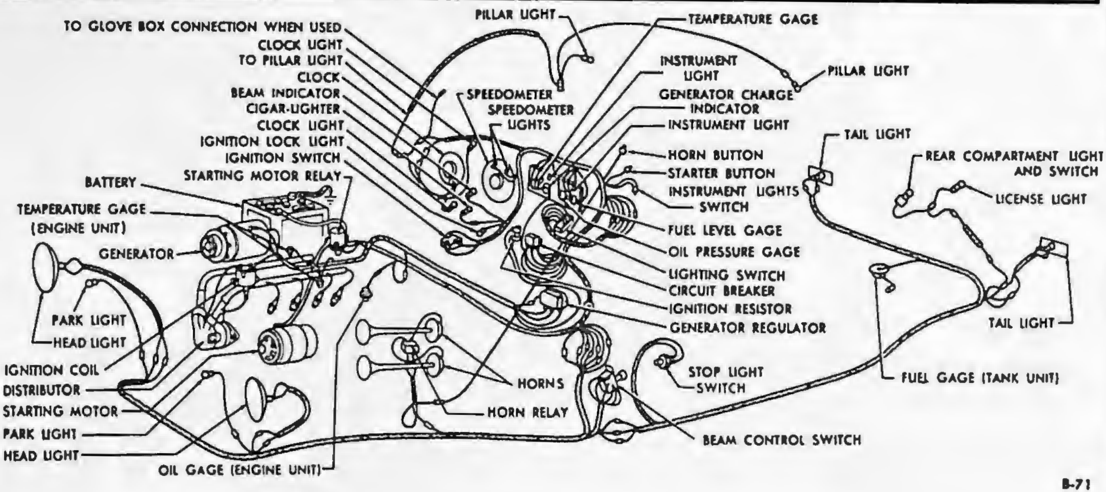


Figure 2—De Luxe and Super De Luxe Ford V-8 Electrical System, 1945-7

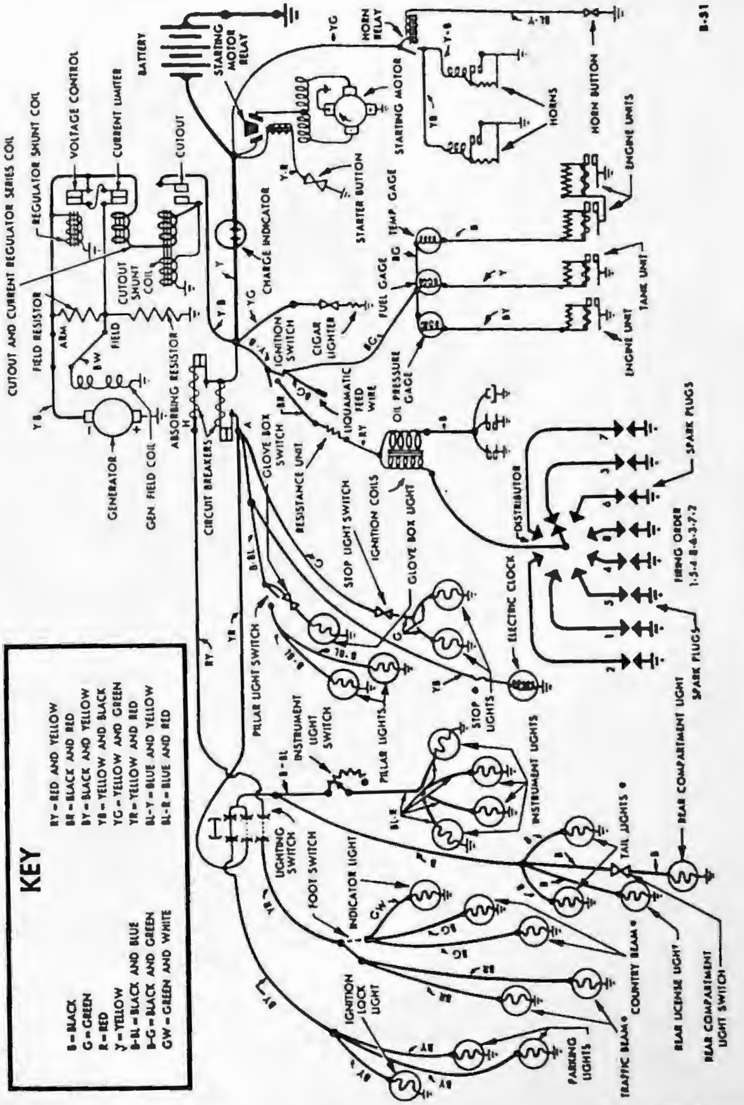


Figure 1—Simplified Wiring Diagram of Mercury, 1945-7

*Taillight, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

1945-7 MERCURY

May 17, 1947

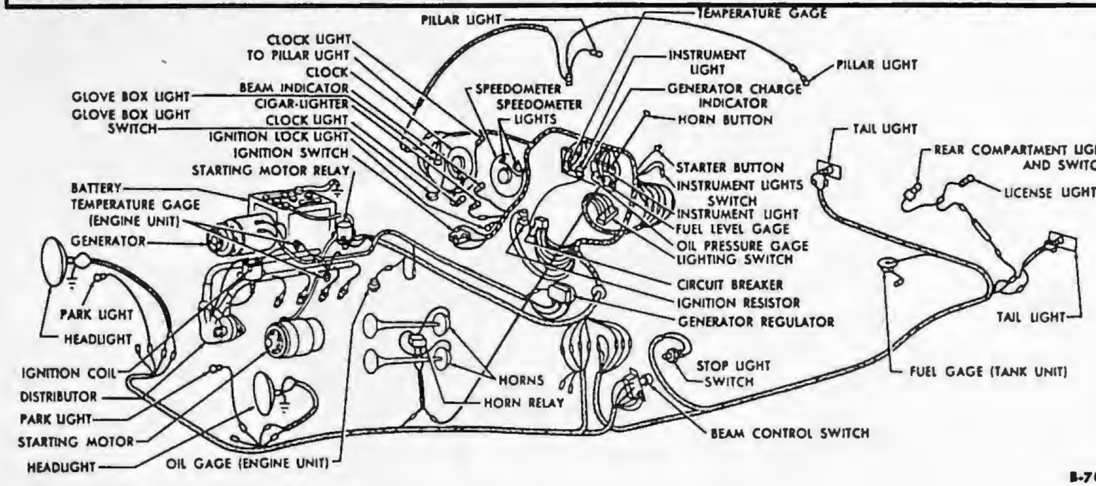
CARS TRUCKS BUSSES
DEALERS'
SERVICE BULLETIN
Subject No. 15999
WIRING
Page No. 170
FORD MERCURY LINCOLN

1945-7 MERCURY

May 17, 1947

KEY

CIRCUITS	COLOR	SIZE	CIRCUITS	COLOR	SIZE
PARKING LIGHT FROM SWITCH	Black and Yellow	16	CLOCK FROM PILLAR LIGHT CIRCUIT	Yellow with Black Tracer	18
HEADLIGHTS (COUNTRY BEAM) FROM BEAM CONTROL SWITCH	Green with Black Tracer	14	IGNITION SWITCH FROM CIRCUIT BREAKER	Yellow with Black Tracer	14
HEAD LIGHTS (TRAFFIC BEAM) FROM BEAM CONTROL SWITCH	Red with Black Tracer	14	IGNITION SWITCH TO RESISTOR	Black and Red	16
INSTRUMENT LIGHTS FROM RHEOSTAT	Blue with Red Tracer	16	IGNITION COIL FROM RESISTANCE	Red	16
INSTRUMENT LIGHT RHEOSTAT FROM LIGHT SWITCH	Black with Blue Tracer	16	GAGES FROM IGNITION SWITCH	Black and Green	16
TAIL, LICENSE, AND REAR COMPARTMENT LIGHTS FROM SWITCH	Black	14	OIL GAGE (ENGINE UNIT) FROM PANEL GAGE	Black and Yellow	16
STOP LIGHT SWITCH TO CIRCUIT BREAKER	Green	14	TEMPERATURE GAGE (ENGINE UNIT) FROM PANEL GAGE	Black	16
PILLAR LIGHTS	Black with Blue Tracer	16	FUEL GAGE (TANK UNIT) FROM PANEL GAGE	Yellow	16
MAIN LIGHT CIRCUIT FROM CIRCUIT BREAKER	Red with Yellow Tracer	12	GENERATOR ARMATURE	Yellow with Black Tracer	10
PARKING LIGHT CIRCUIT FROM CIRCUIT BREAKER	Yellow with Red Tracer	12	CIRCUIT BREAKER TO STARTING MOTOR RELAY	Yellow	10
STOP LIGHT SWITCH TO CONNECTOR	Red	14	STARTING MOTOR	Black	1
R.H. REAR STOP LIGHT	Green with Red Tracer	14	HORN RELAY FROM STARTING MOTOR	Yellow with Green Tracer	10
			HORN BUTTON FROM HORN RELAY	Blue with Yellow Tracer	14
			HORN FROM RELAY	Yellow with Green Tracer	14
			L.H. REAR STOP LIGHT	Green with Yellow Tracer	14



B-70

Figure 2—Mercury Electrical System, 1945-7

KEY

B = BLACK	B-BL = BLACK AND BLUE	BL-Y = BLUE AND YELLOW	YB = YELLOW AND BLACK
BL = BLUE	BG = BLACK AND GREEN	GB = GREEN AND BLACK	Y-BL = YELLOW AND BLUE
G = GREEN	BR = BLACK AND RED	GW = GREEN AND WHITE	YG = YELLOW AND GREEN
R = RED	BY = BLACK AND YELLOW	R-BL = RED AND BLUE	YR = YELLOW AND RED
Y = YELLOW	BL-R = BLUE AND RED	RG = RED AND GREEN	

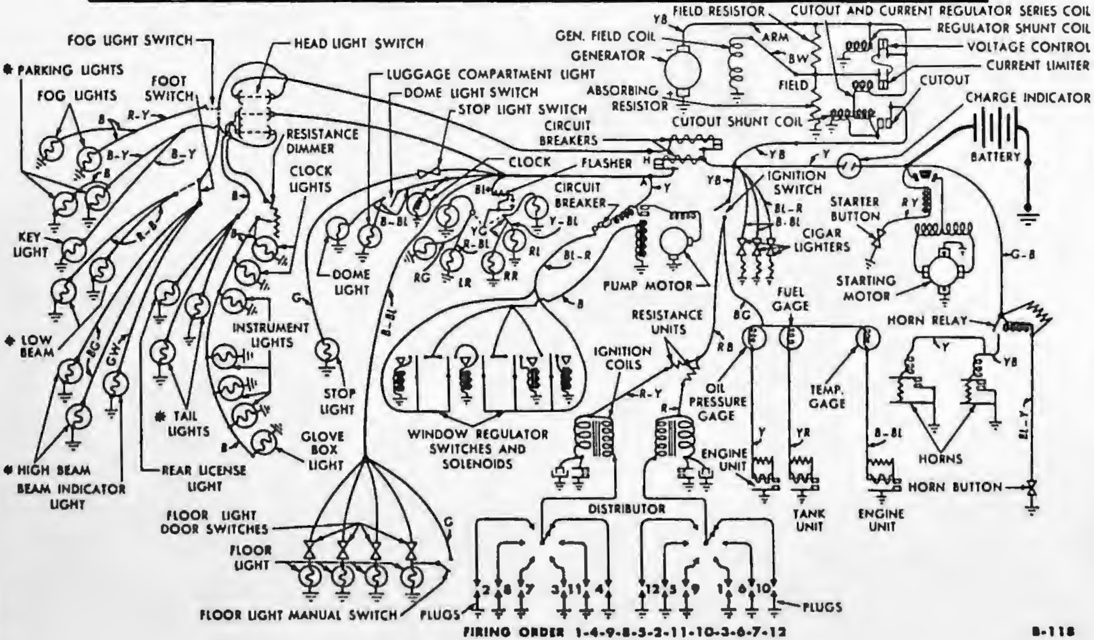


Figure 1—Simplified Wiring Diagram of Lincoln, 1945-7

*Taillight, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

CARS TRUCKS BUSSES

DEALERS' SERVICE BULLETIN

Ford Mercury Lincoln

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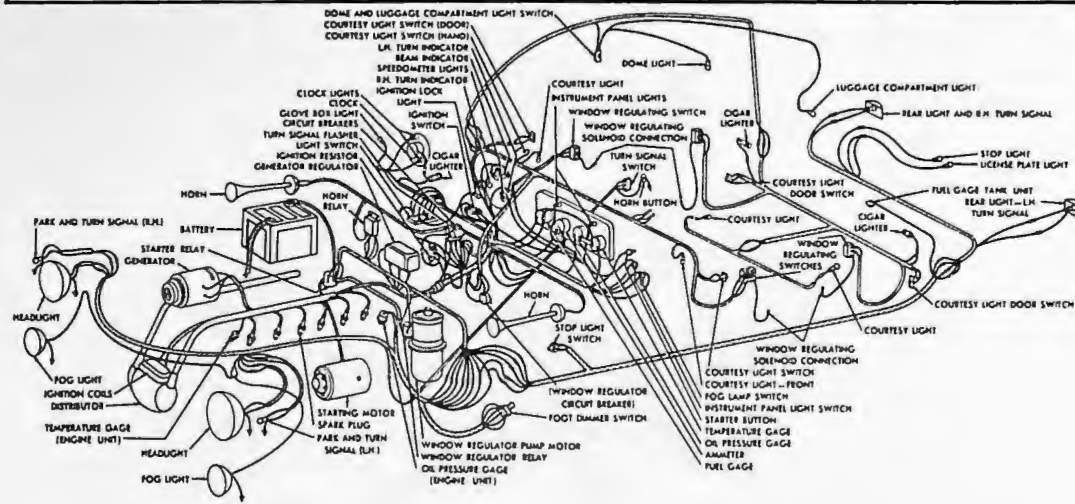
KEY

CIRCUITS	COLOR	SIZE	CIRCUITS	COLOR	SIZE	CIRCUITS	COLOR	SIZE
BEAM CONTROL SWITCH FEED	Red	12	TURN SIGNAL L. H. FRONT	Red with Green Tracer	14	STARTER RELAY THROUGH AMMETER TO IGNITION SWITCH	Yellow	10
HEADLIGHTS (COUNTRY BEAM)	Green with Black Tracer	14	TURN SIGNAL L. H. REAR	Red with Blue Tracer	14	HORN RELAY FEED	Green with Black Tracer	10
HEADLIGHTS (CITY BEAM)	Red with Black Tracer	14	TURN SIGNAL L. H. INDICATOR	Green with Red Tracer	14	IGNITION SWITCH TO GAGES	Green with Black Tracer	14
BEAM INDICATOR	Green with White Tracer	16	GENERATOR ARM TO REGULATOR	Yellow with Black Tracer	10	IGNITION SWITCH TO RESISTORS	Red with Black Tracer	12
PARK LIGHTS	Black with Yellow Tracer	16	GENERATOR FIELD TO REGULATOR	Black	16	IGNITION SWITCH TO CIRCUIT BREAKER	Yellow with Black Tracer	10
FOG LIGHTS	Red with Yellow Tracer	14	GENERATOR GROUND TO REGULATOR	Black with Red Tracer	16	CIRCUIT BREAKER TO GENERATOR REGULATOR	Yellow	10
REAR LIGHTS AND LICENSE PLATE LIGHT	Black	14	TEMPERATURE GAGE	Black with Blue Tracer	16	FLASHER FEED	Yellow	14
STOP LIGHTS	Green	14	OIL PRESSURE GAGE	Yellow	16	WINDOW REGULATOR SWITCH FEED	Blue with Red Tracer	14
DOME AND LUGGAGE COMPARTMENT LIGHTS	Black with Blue Tracer	14	FUEL LEVEL GAGE	Yellow with Red Tracer	16	WINDOW REGULATOR MOTOR CONTROL	Black	14
COURTESY LIGHTS	Yellow with Green Tracer	14	IGNITION COIL TO RESISTOR R. H.	Red	16	WINDOW REGULATOR SOLENOID CONTROL	Black	14
INSTRUMENT PANEL LIGHTS	Black	16	IGNITION COIL TO RESISTOR L. H.	Red with Yellow Tracer	16	TURN SIGNAL SWITCH FEED	Blue	14
IGNITION LOCK LIGHT	Black with Yellow Tracer	16	HORN RELAY TO HORN (R. H.)	Yellow with Black Tracer	10	WINDOW REGULATOR L. H. FRONT SWITCH TO R. H. FRONT SWITCH	Yellow with Black Tracer	14
TURN SIGNAL R. H. FRONT	Yellow with Green Tracer	14	R. H. HORN TO L. H. HORN	Yellow	12			
TURN SIGNAL R. H. REAR	Yellow with Blue Tracer	14	HORN BUTTON TO RELAY	Blue with Yellow Tracer	16			
TURN SIGNAL R. H. INDICATOR	Blue with Yellow Tracer	14	STARTER BUTTON TO RELAY	Red with Yellow Tracer	16			
			WINDOW REGULATOR PUMP MOTOR FEED	Yellow	6			

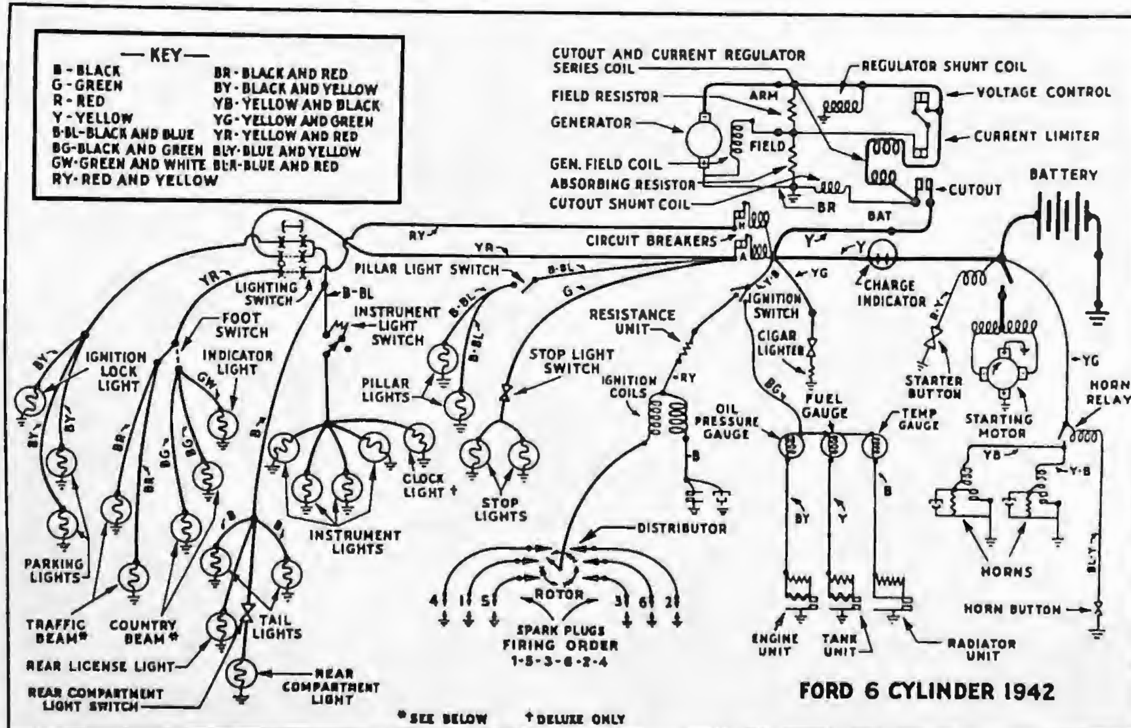


B-72

Figure 2—Lincoln Electrical System, 1945-7

1945-7 LINCOLN

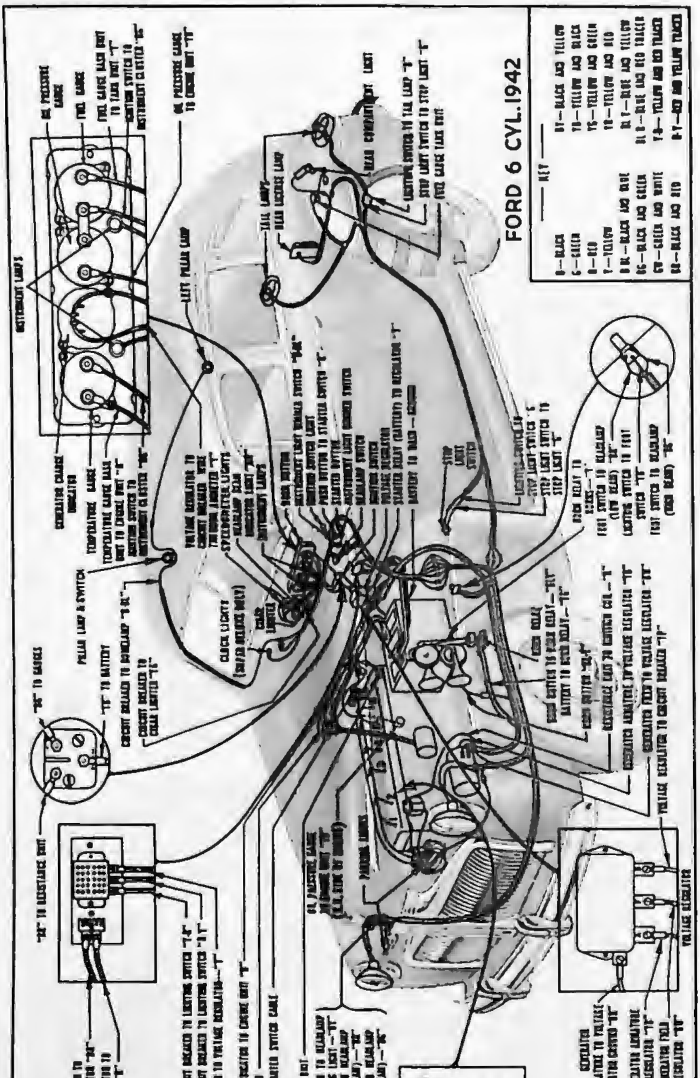
May 17, 1947



SIMPLIFIED WIRING DIAGRAM OF 6 CYL. CAR, 1942

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown on separate bulbs in this diagram to simplify the circuits.

Fig. 1

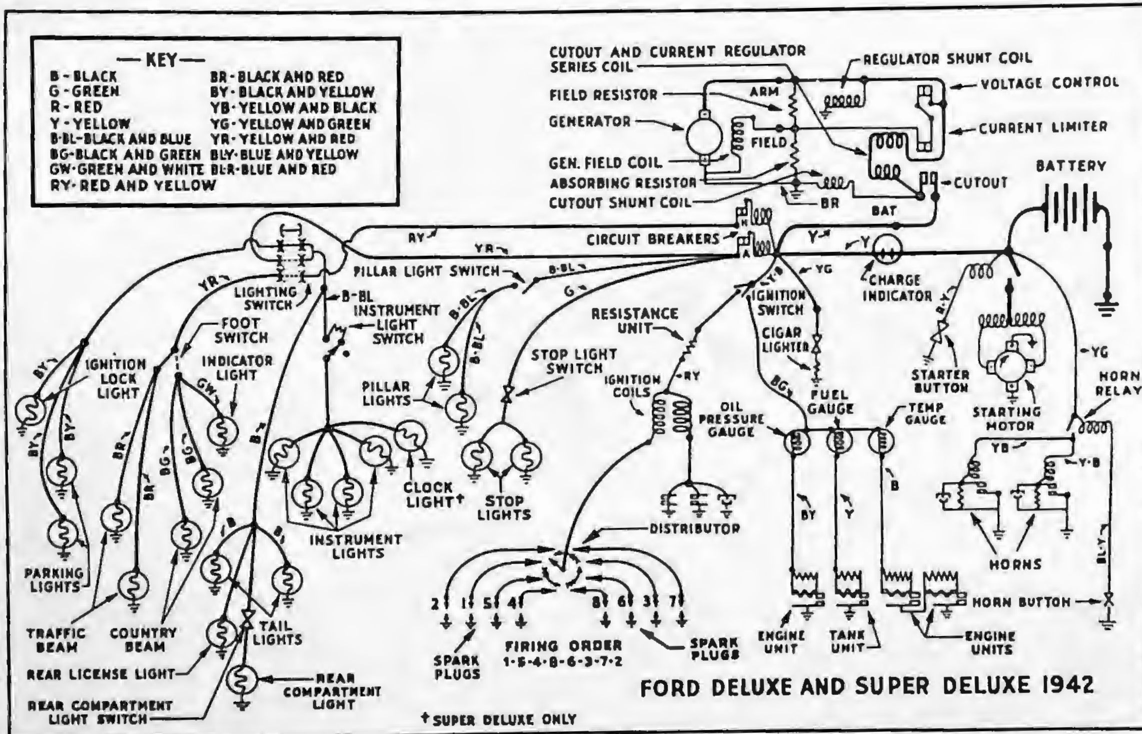


6 Cyl. Car Phantom Electrical System, 1942

Fig. 2

1942 6 CYL. CAR

Feb. 20, 1942



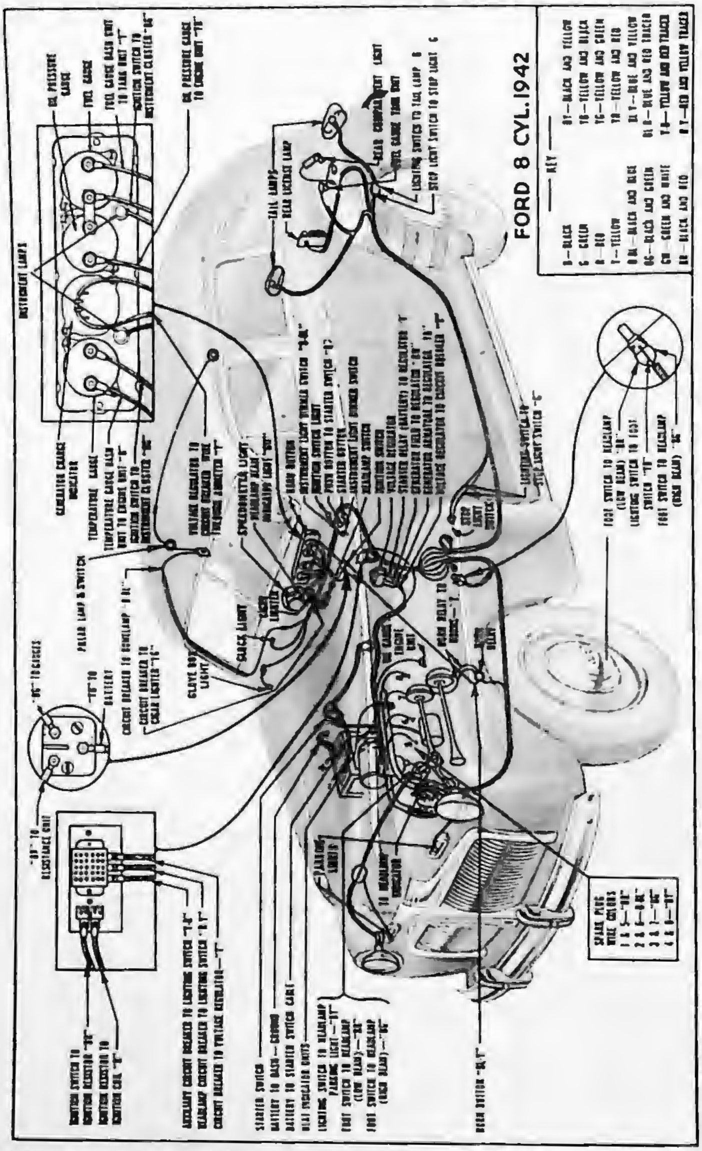
SIMPLIFIED WIRING DIAGRAM OF DELUXE AND SUPER DELUXE FORD V-8, 1942

*Tail light, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

1942 DE LUXE AND SUPER DE LUXE FORD V-8

Feb. 20, 1942



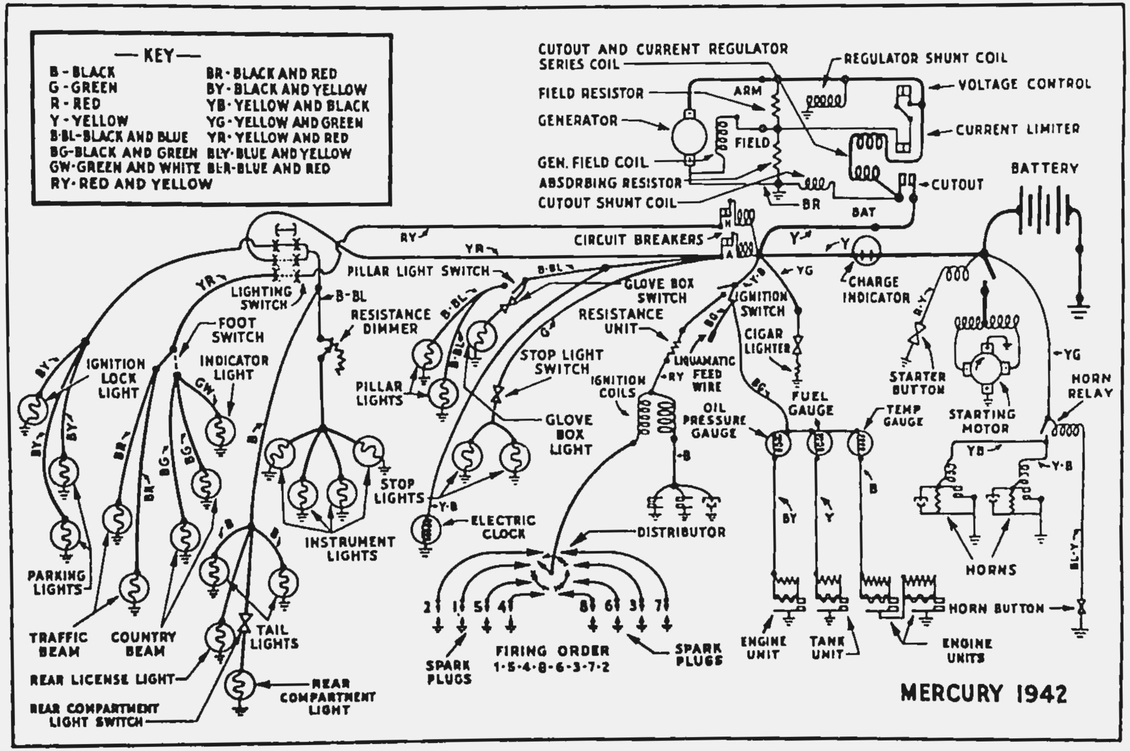
Deluxe and Super Deluxe Ford V-8 Phantom Electrical System, 1942

Fig. 2

1942 DE LUXE AND SUPER DE LUXE FORD V-8

Feb. 20, 1942

Printed in U.S.A.



SIMPLIFIED WIRING DIAGRAM OF MERCURY, 1942

*Tail light, stop light and headlight bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

SERVICE *Mercury* BULLETIN

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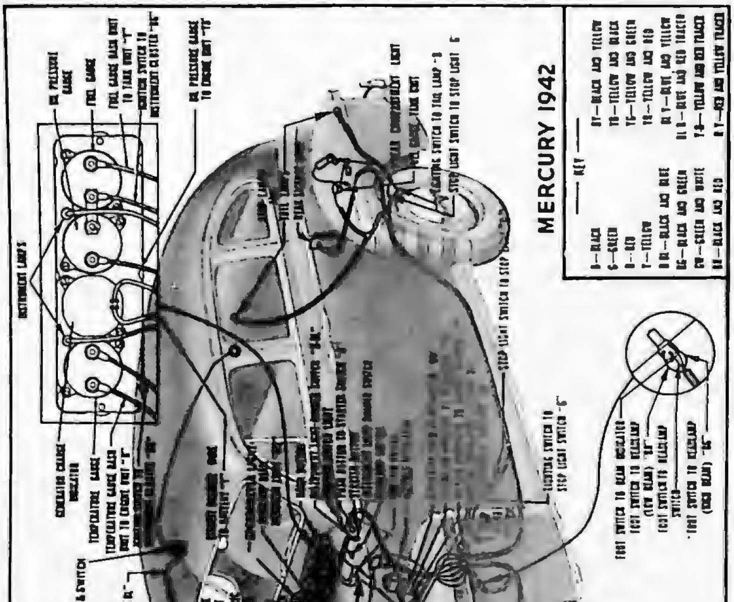


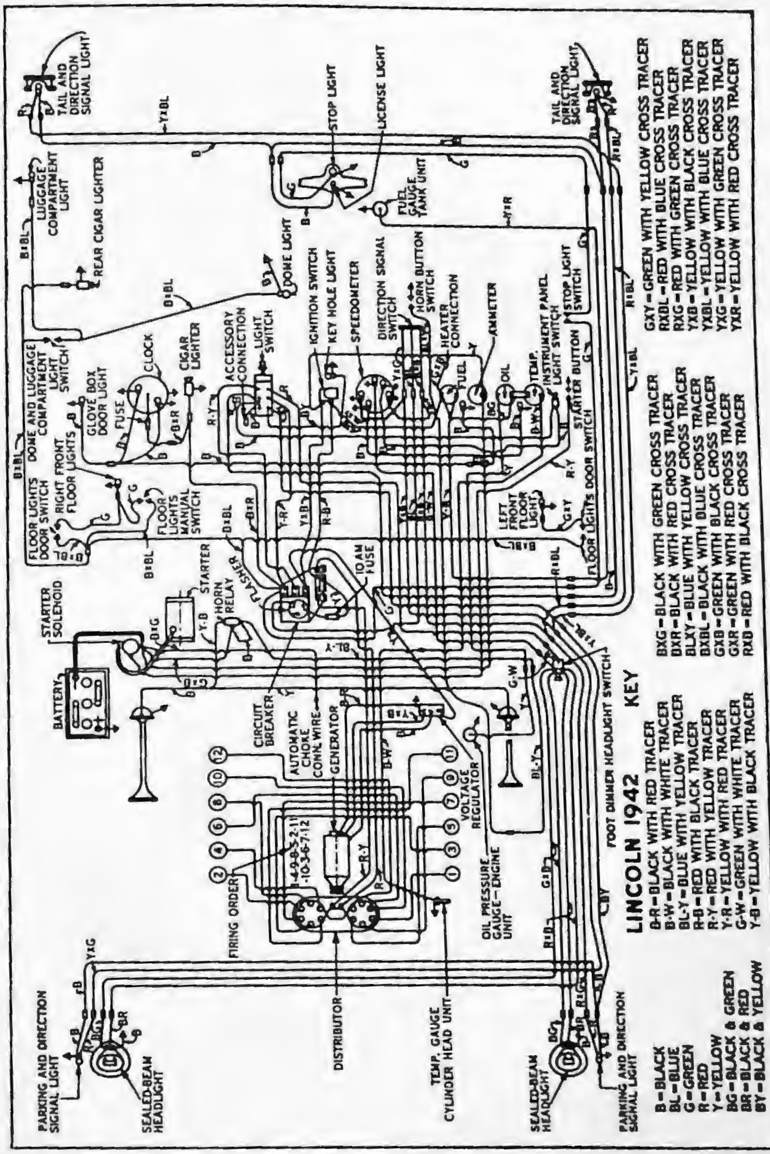
Mercury Phantom Electrical System, 1942

Fig. 2

1942 MERCURY

Feb. 20, 1942

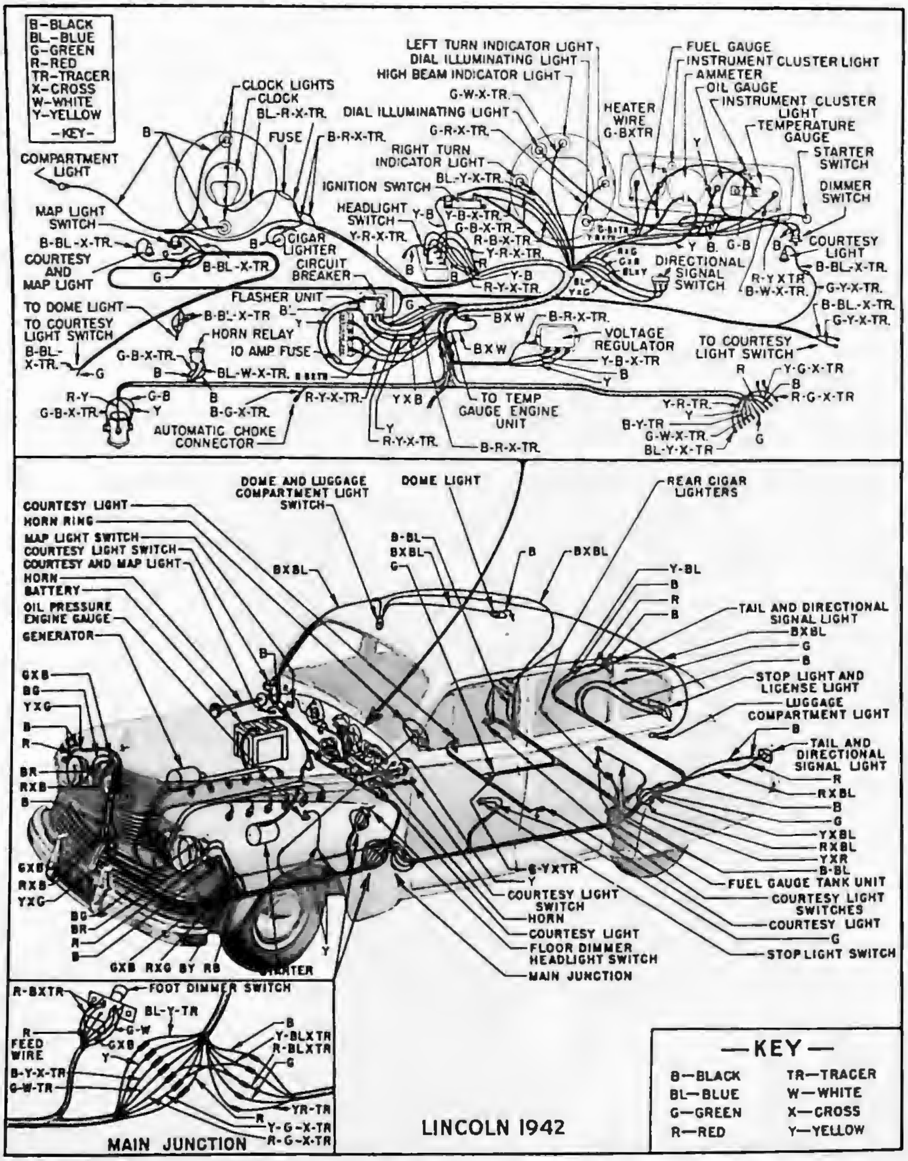
Printed in U.S.A.



WIRING DIAGRAM OF LINCOLN-ZEPHYR AND LINCOLN, 1942

Fig. 1

1942 LINCOLN-ZEPHYR AND LINCOLN

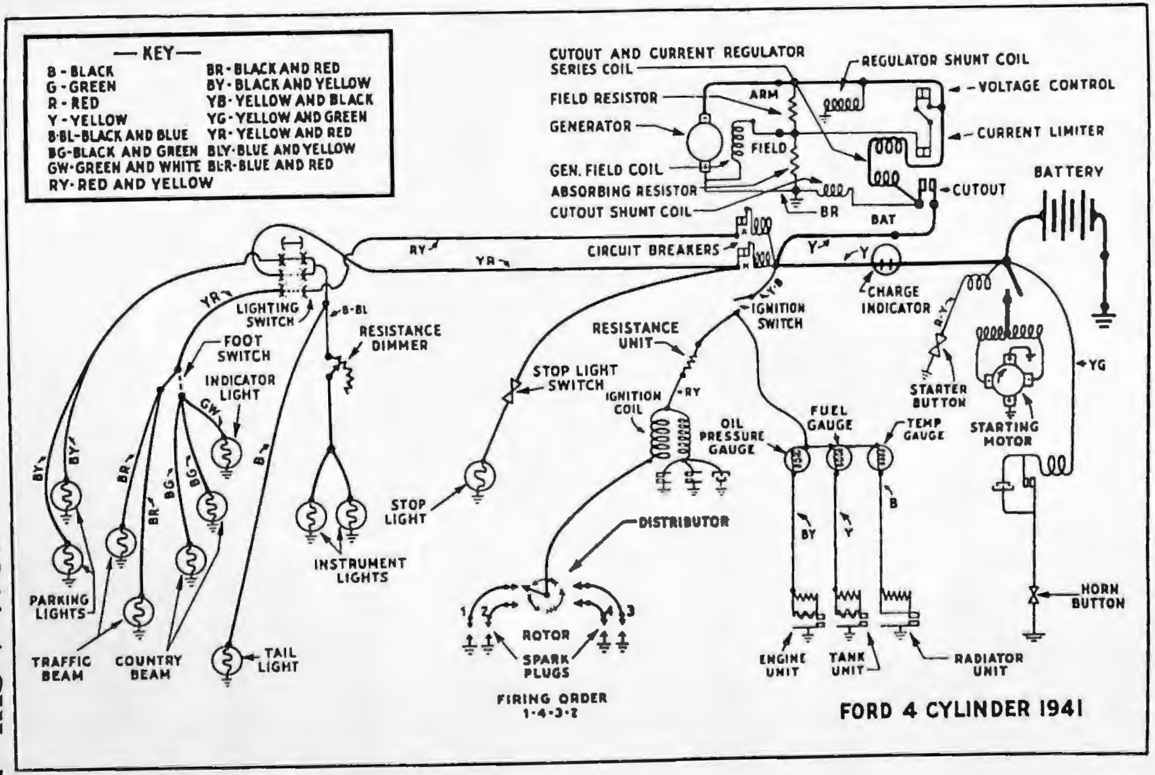


LINCOLN AND LINCOLN-ZEPHYR PHANTOM ELECTRICAL SYSTEM, 1942

Fig. 2

1942 LINCOLN-ZEPHYR AND LINCOLN

Feb. 20, 1942



SIMPLIFIED WIRING DIAGRAM OF 4 CYL. TRUCK, 1941

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

1941 4 CYL. TRUCK

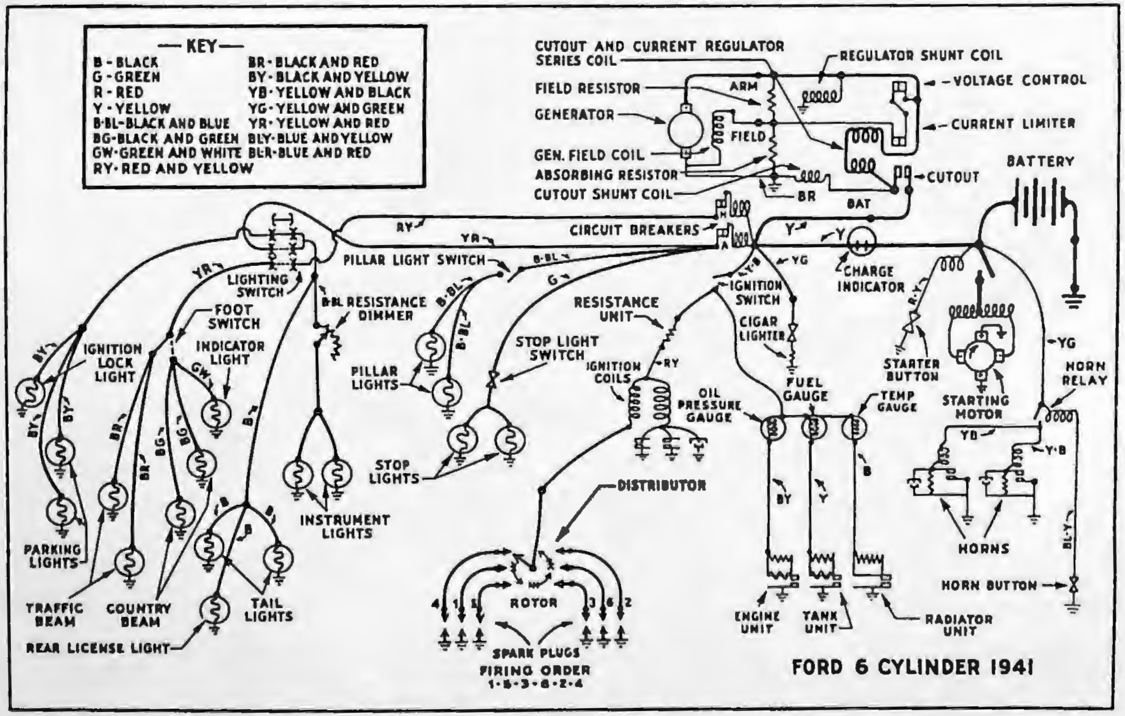
April 16, 1941

Printed in U.S.A.

Be of an inquiring mind. Things do not just happen. There is an underlying cause for every failure. Find it—and you will be a better mechanic. Your customers will be satisfied with your work, and the reputation of the car can be more safely entrusted to your hands.

April 16, 1941

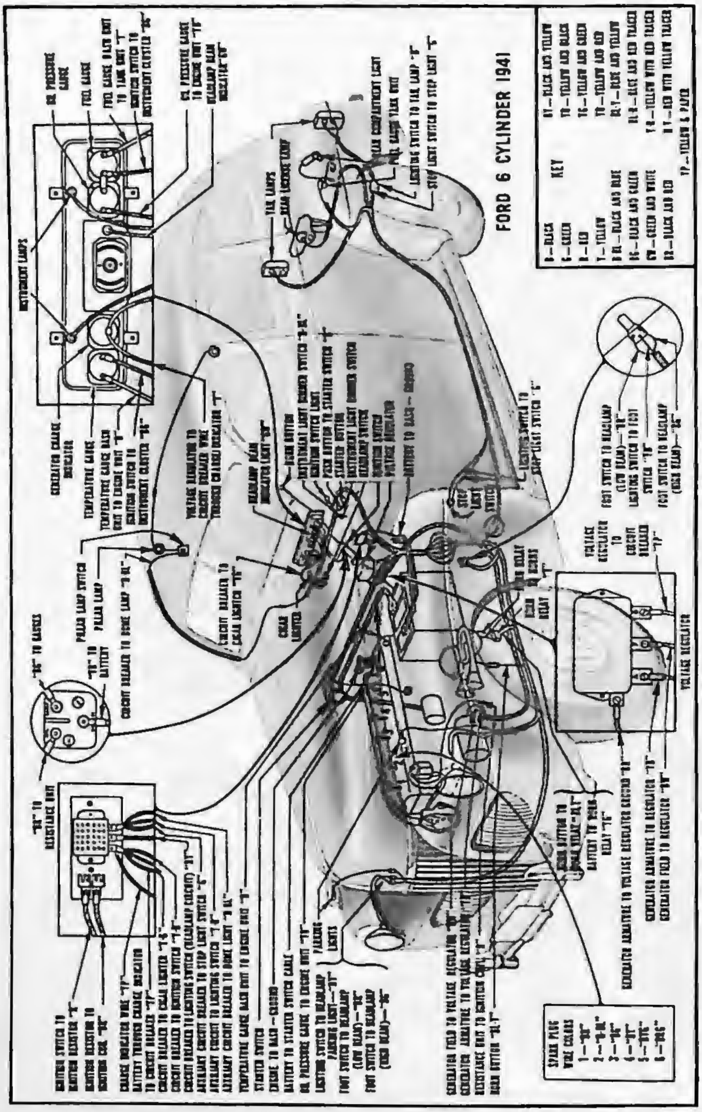
Printed in U.S.A.



SIMPLIFIED WIRING DIAGRAM OF 6 CYL. CAR, 1941

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1



6 Cyl. Car Phantom Electrical System, 1941

Fig. 2

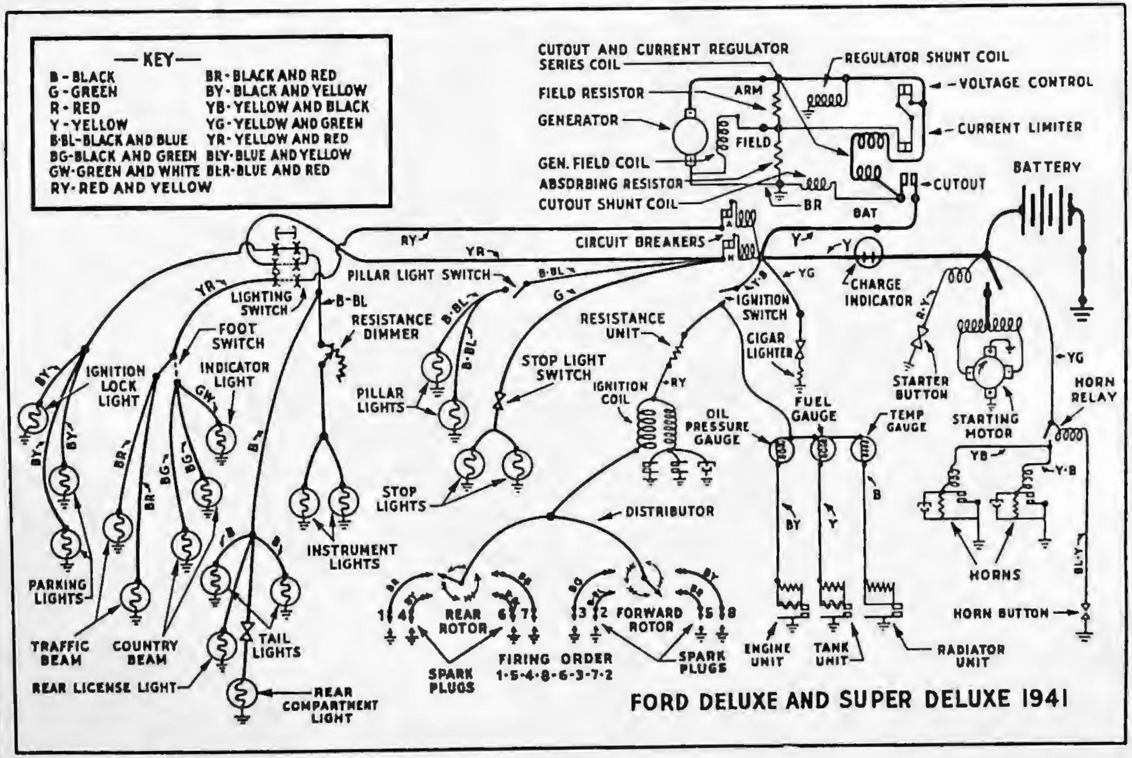
1941 6 CYL. CAR

May 20, 1941

Printed in U.S.A.

1941 DE LUXE AND SUPER DE LUXE FORD V-8

April 16, 1941



SIMPLIFIED WIRING DIAGRAM OF DELUXE AND SUPER DELUXE FORD V-8, 1941

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

Printed in U.S.A.

SERVICE (Ford) BULLETIN

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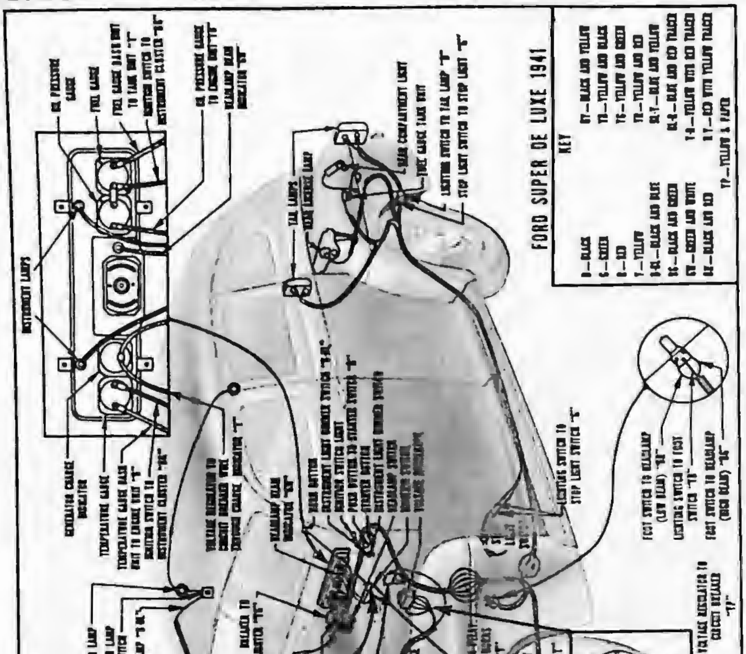


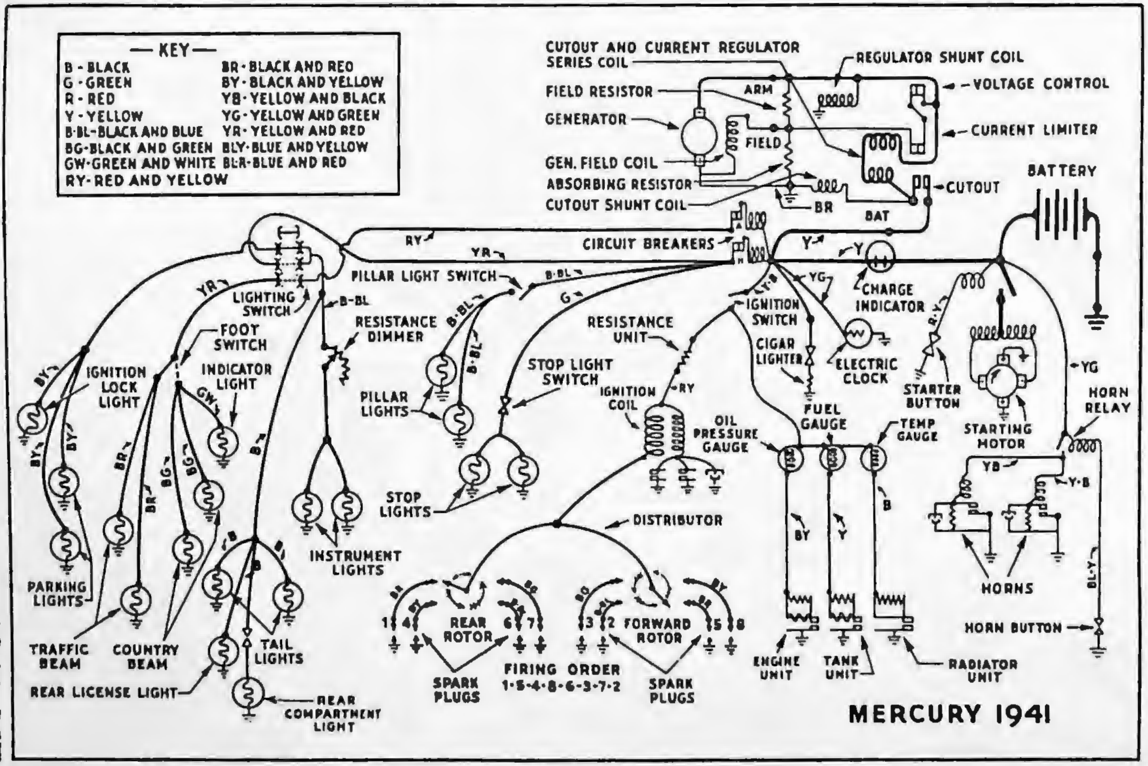
Deluxe and Super Deluxe Ford V-8 Phantom Electrical System, 1941

Fig. 2

1941 DE LUXE AND SUPER DE LUXE FORD V-8

April 16, 1941

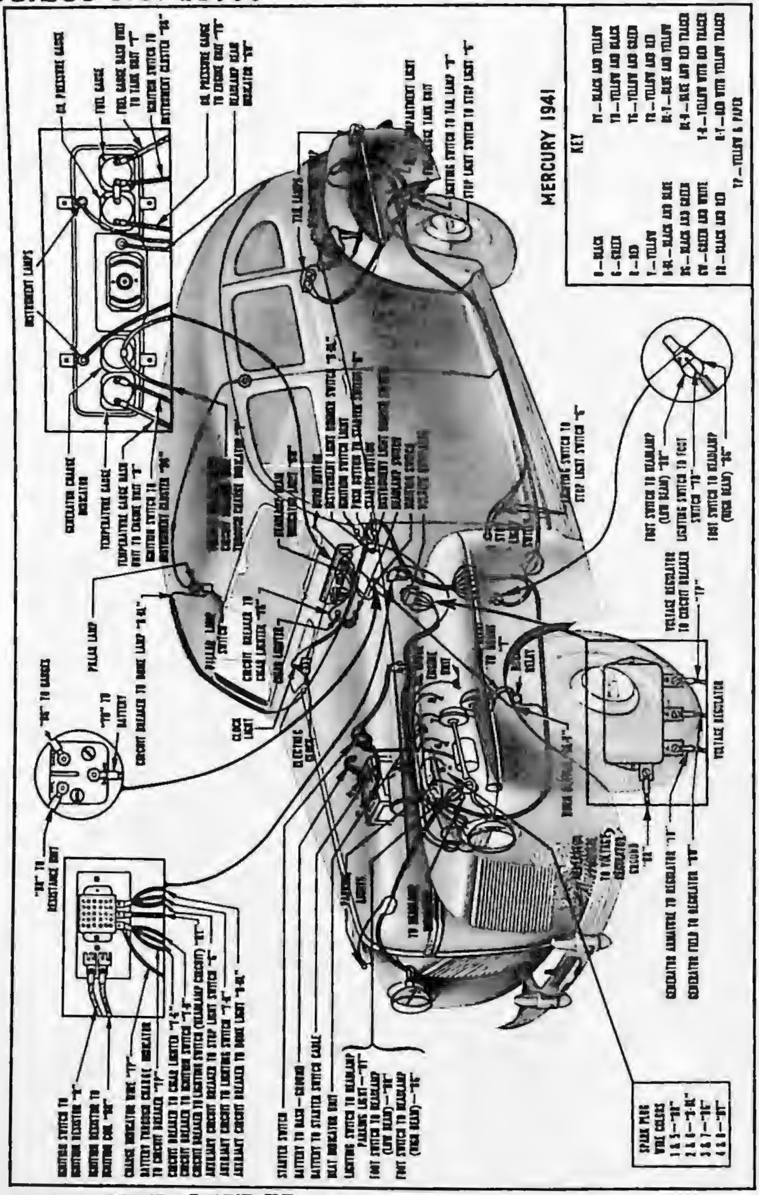
Printed in U.S.A.



SIMPLIFIED WIRING DIAGRAM OF MERCURY, 1941

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

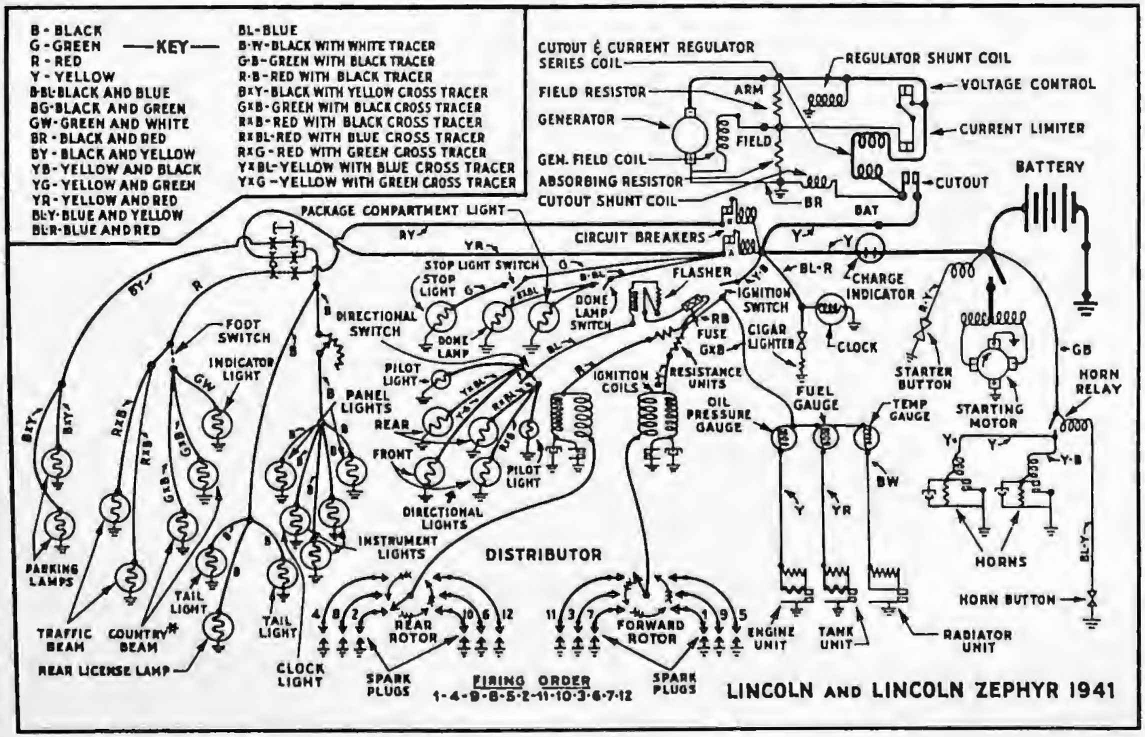
Fig. 1



Mercury Phantom Electrical System, 1941

Fig. 2

April 16, 1941



SIMPLIFIED WIRING DIAGRAM OF LINCOLN-ZEPHYR AND LINCOLN, 1941

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

SERVICE BULLETIN

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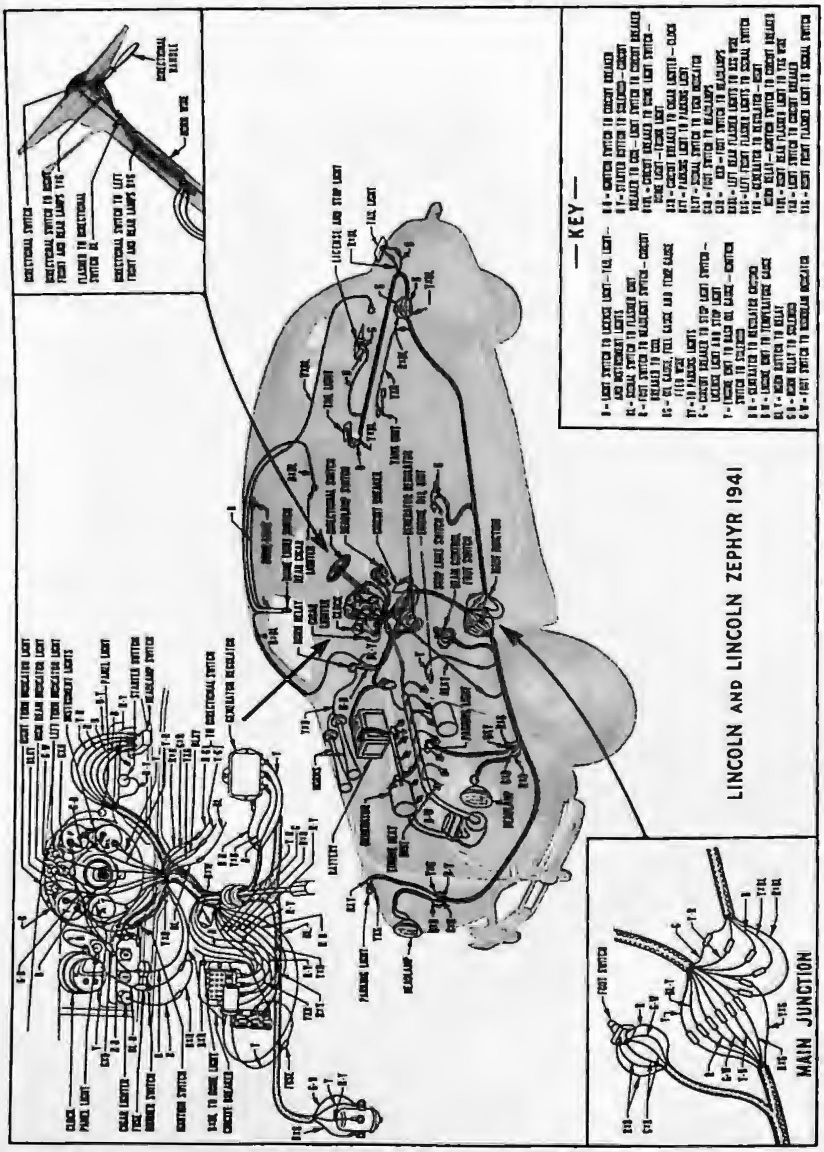
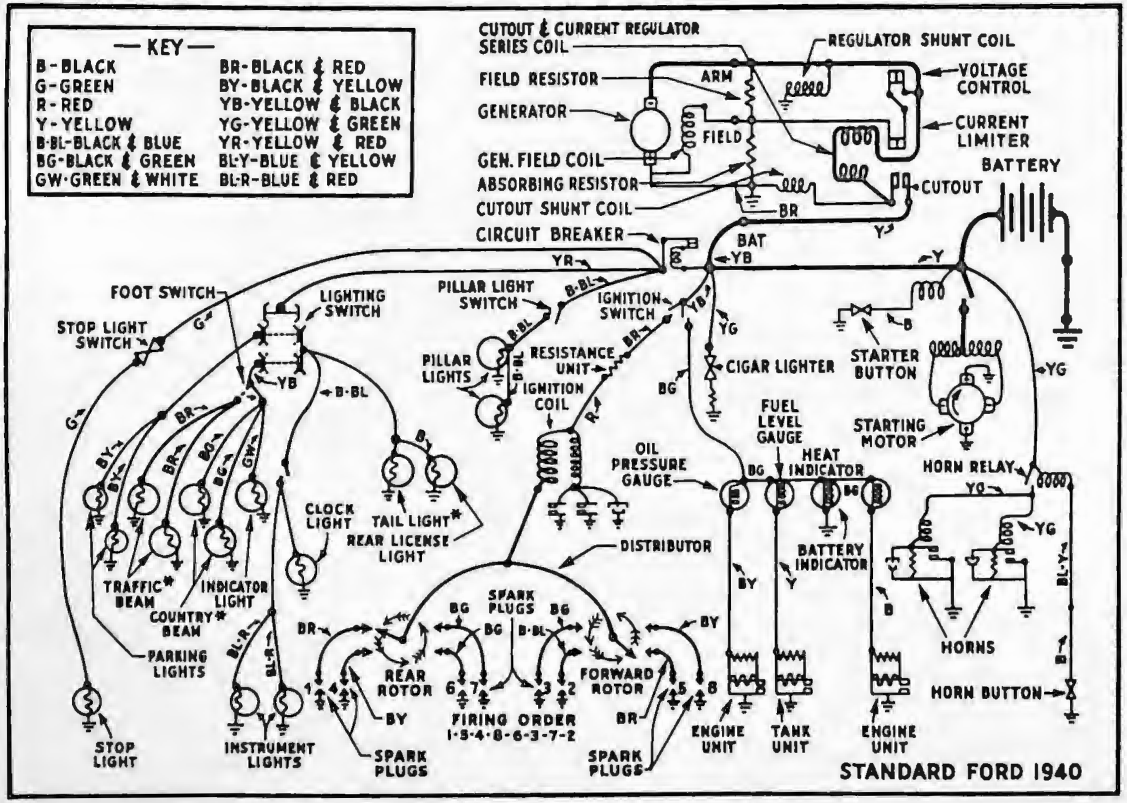


Lincoln and Lincoln-Zephyr Phantom Electrical System, 1941
Fig. 2

1941 LINCOLN-ZEPHYR AND LINCOLN

April 16, 1941

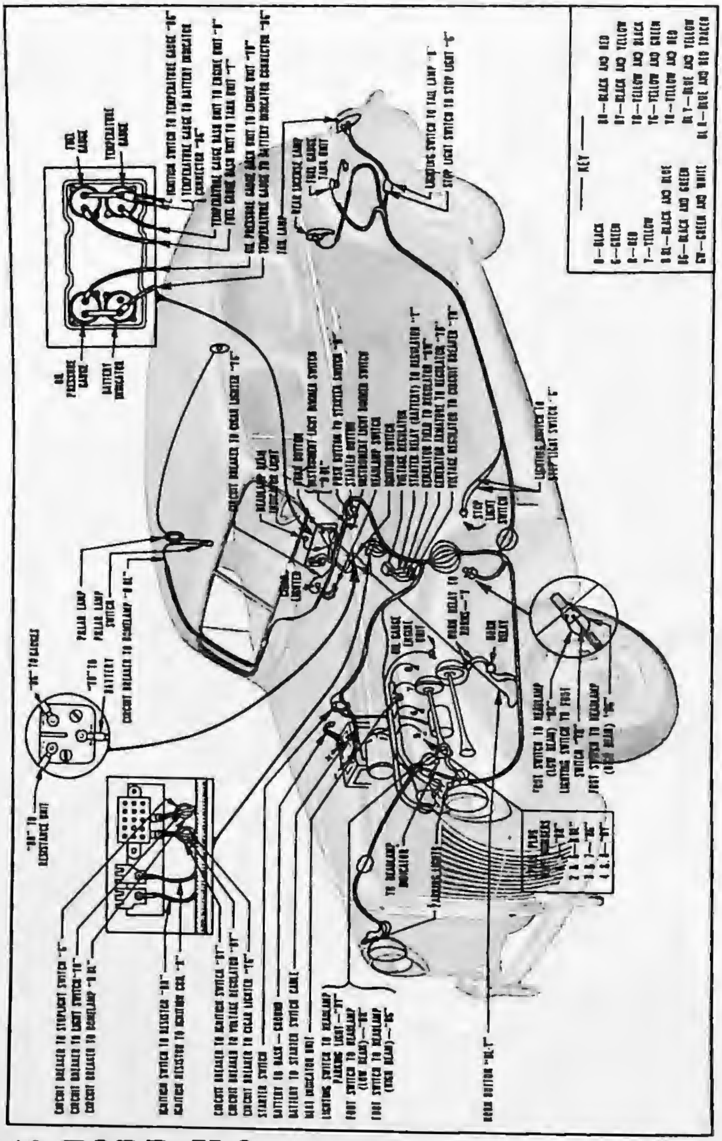
Printed in U.S.A.



Simplified Wiring Diagram of Ford V-8, 1940

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1



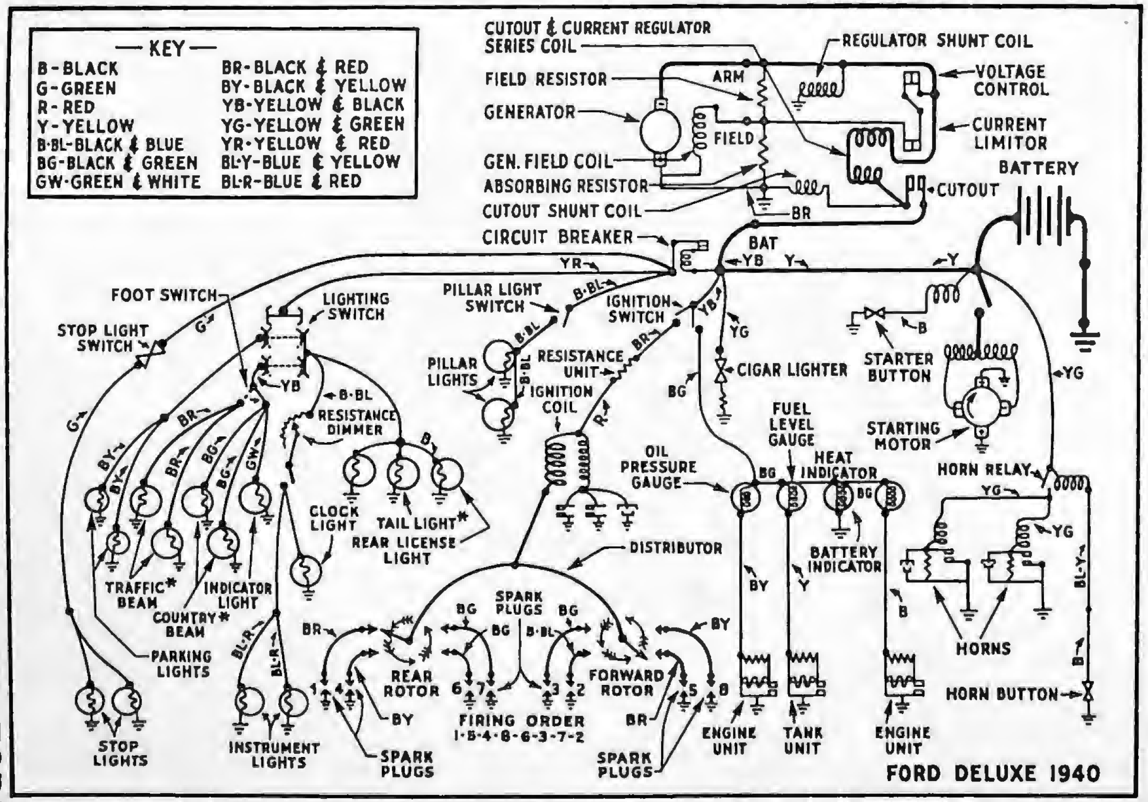
Ford V-8 Phantom Electrical System, 1940

Fig. 2

1940 FORD V-8

April 16, 1941

Printed in U.S.A.



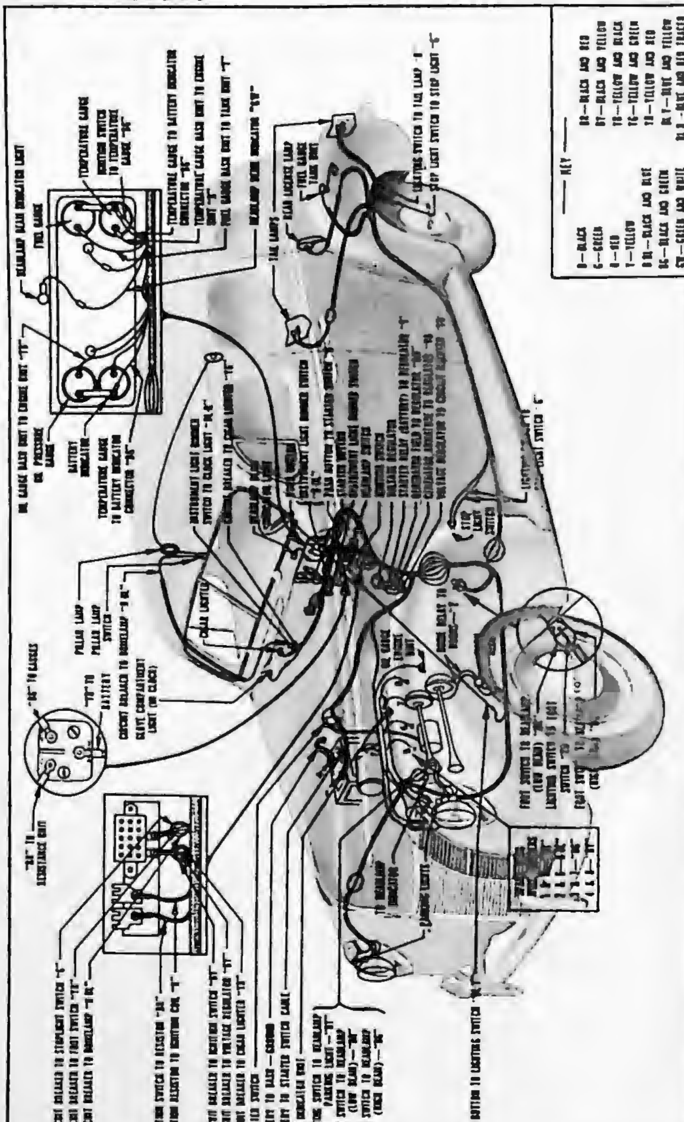
Simplified Wiring Diagram of Deluxe Ford V-8, 1940

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

1940 DE LUXE FORD V-8

April 16, 1941



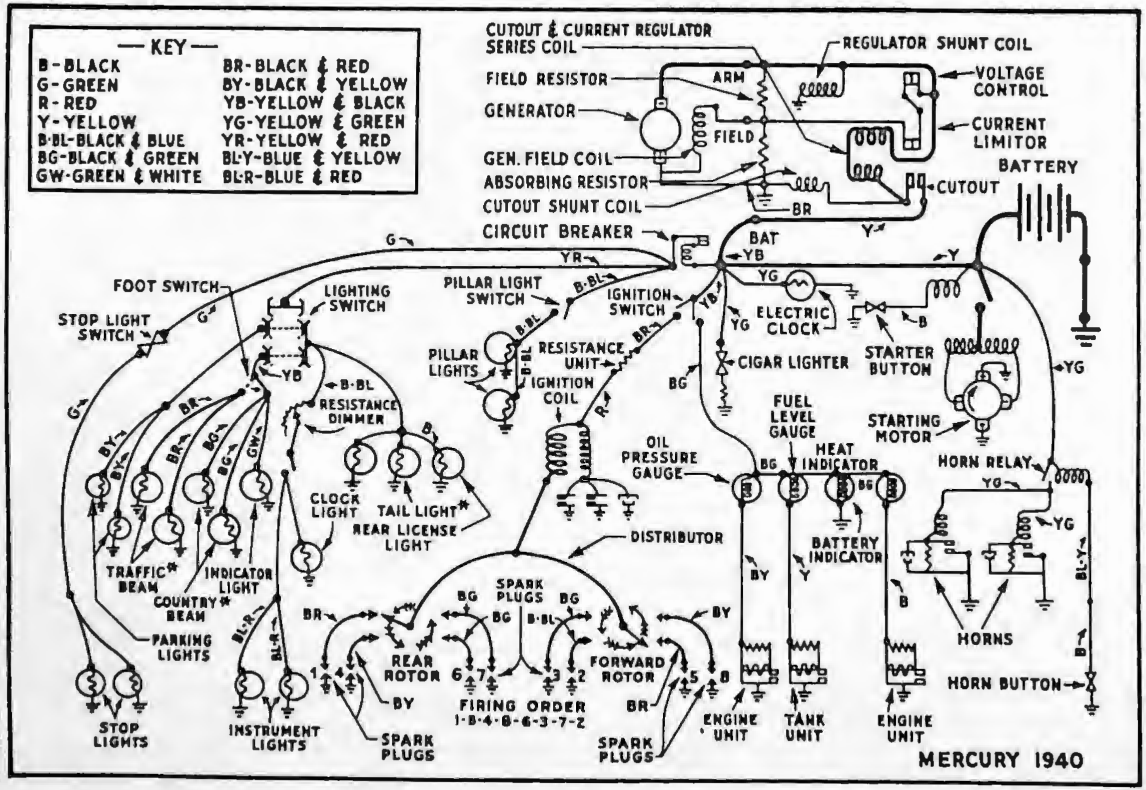
Deluxe Ford V-8 Phantom Electrical System, 1940

Fig. 2

1940 DE LUXE FORD V-8

April 16, 1941

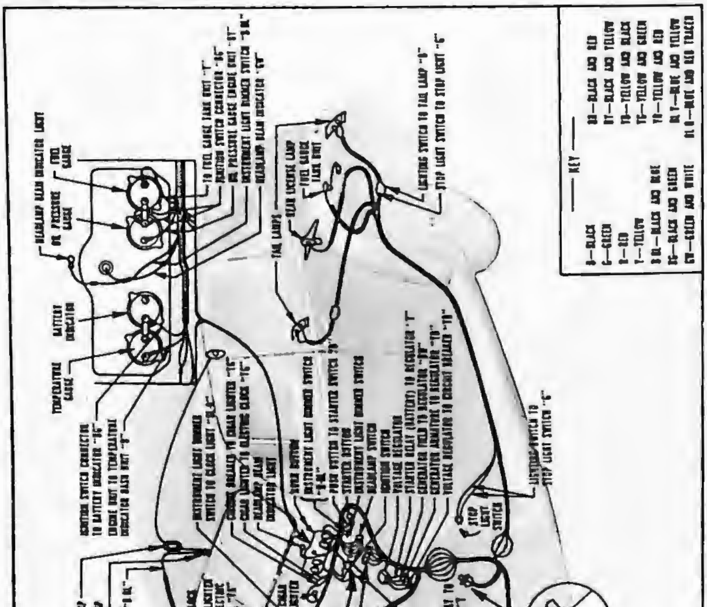
Printed in U.S.A.



Simplified Wiring Diagram of Mercury Car, 1940

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

Fig. 1

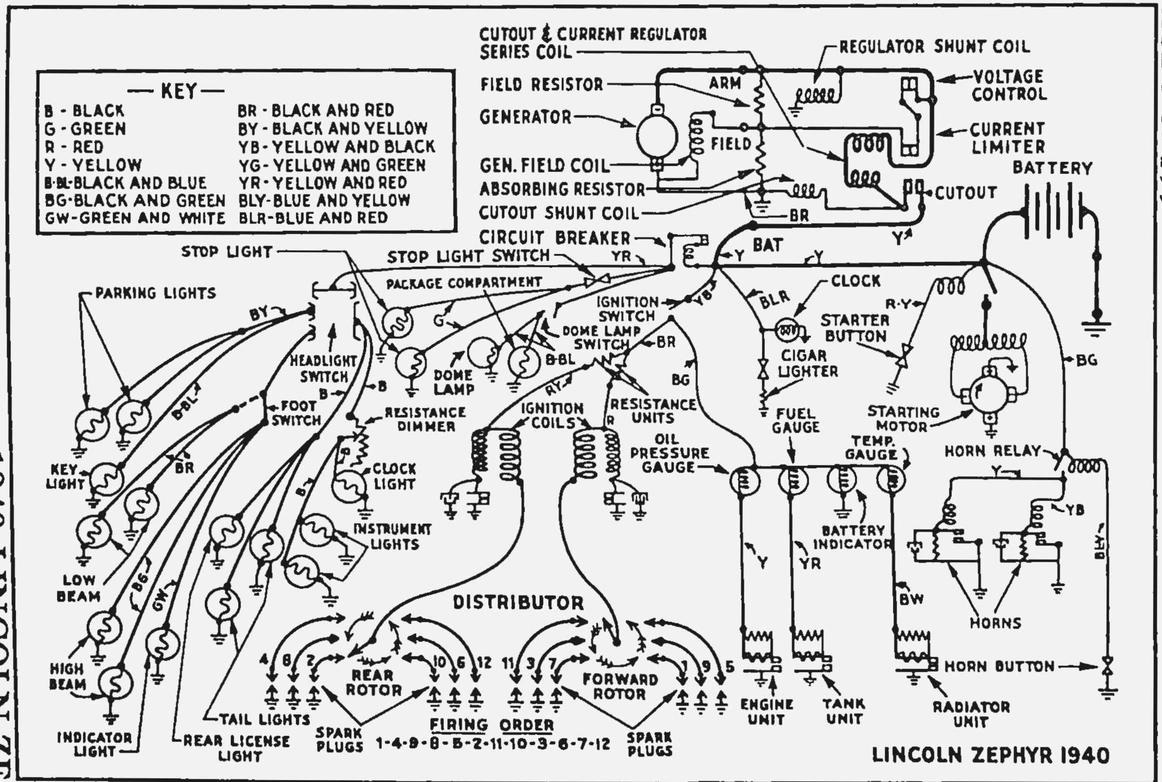


MERCURY PHANTOM ELECTRICAL SYSTEM, 1940

Fig. 2

1940 MERCURY

April 16, 1941



Simplified Wiring Diagram of Lincoln-Zephyr, 1940

*Tail light, stop light and head light bulbs are actually two filament bulbs; they have been shown as separate bulbs in this diagram to simplify the circuits.

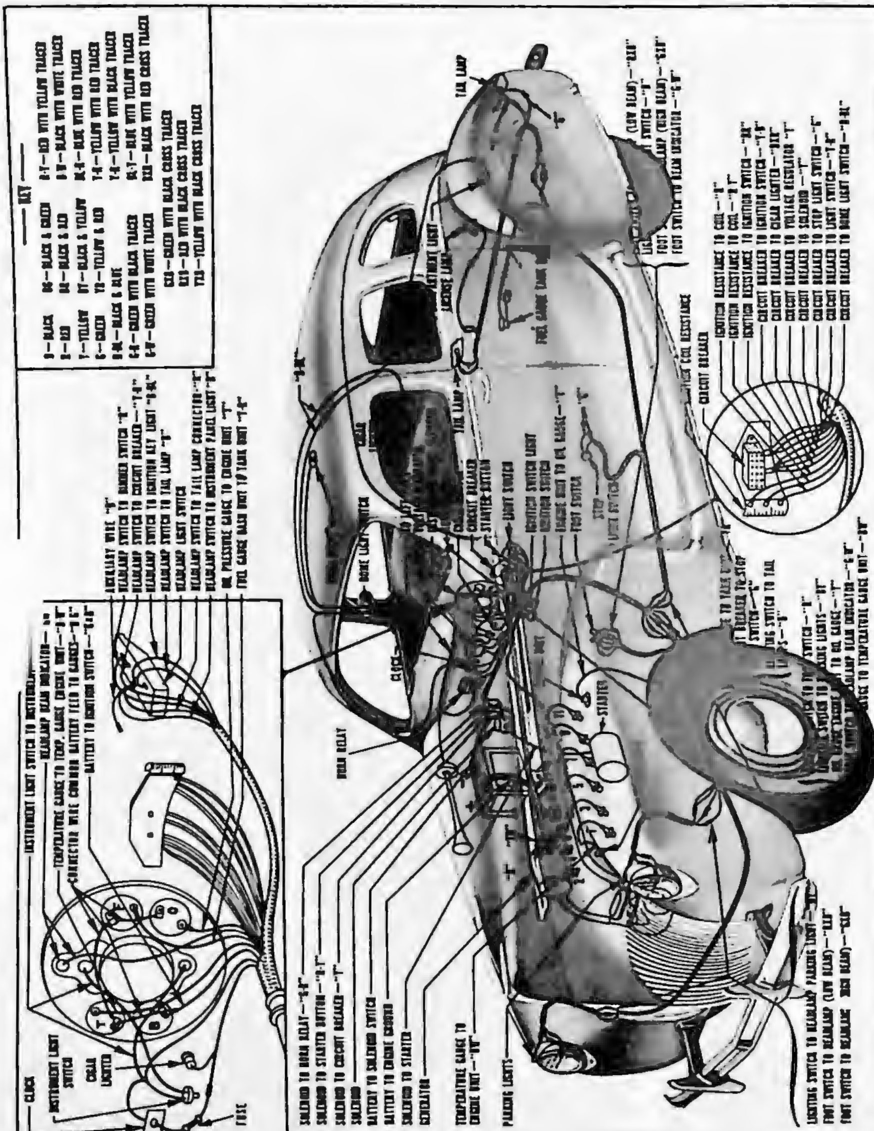
Fig. 1

1940 LINCOLN-ZEPHYR

April 16, 1941

SERVICE BULLETIN

SUBJECT NO. 15999 PAGE NO. 200



Lincoln-Zephyr Phantom Electrical System, 1940

Fig. 2

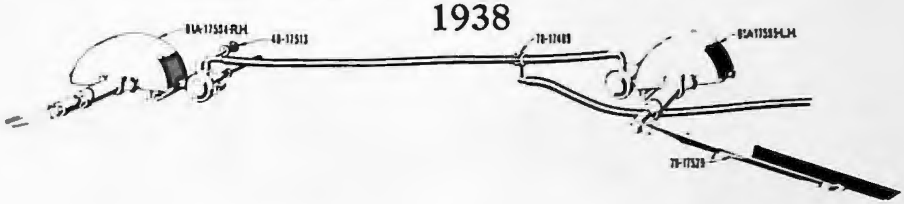
1940 LINCOLN-ZEPHYR

April 16, 1941

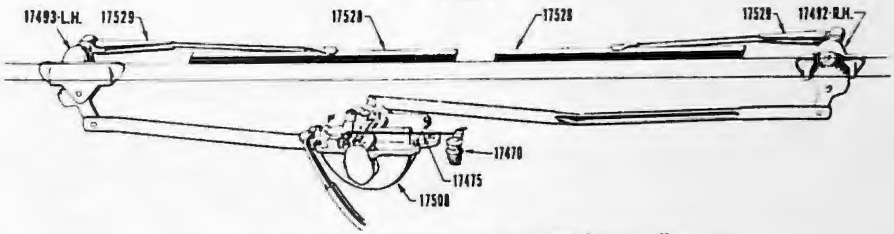
Printed in U.S.A.

WINDSHIELD WIPER

1938



WINDSHIELD WIPER ARRANGEMENT FOR 1938 FORD
Fig. 1



WINDSHIELD WIPER ARRANGEMENT FOR 1938 LINCOLN-ZEPHYR
Fig. 2

1939

WINDSHIELD WIPER ARRANGEMENT FOR 1939 FORD
Fig. 3

ABOVE APPLIES TO MODELS:

1938-39

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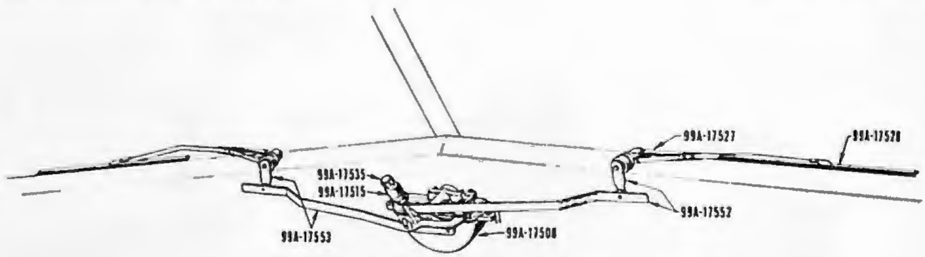
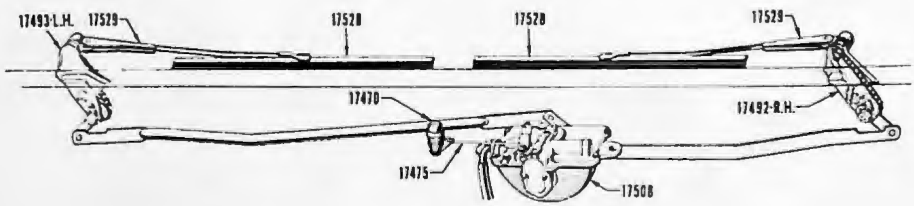
April 1, 1941



WINDSHIELD WIPER ARRANGEMENT FOR 1939 MERCURY

Fig. 4



WINDSHIELD WIPER ARRANGEMENT FOR 1939 LINCOLN-ZEPHYR

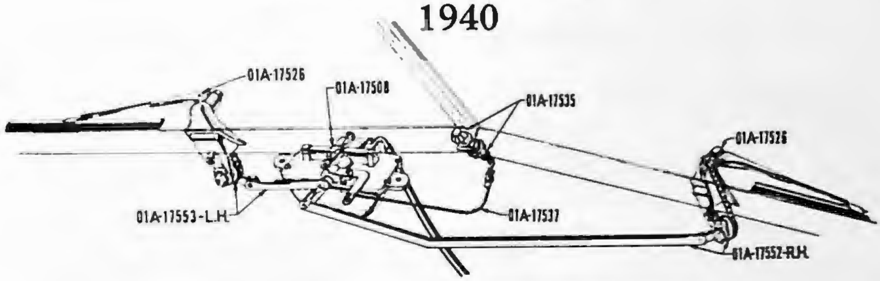
Fig. 5

ABOVE APPLIES TO MODELS:

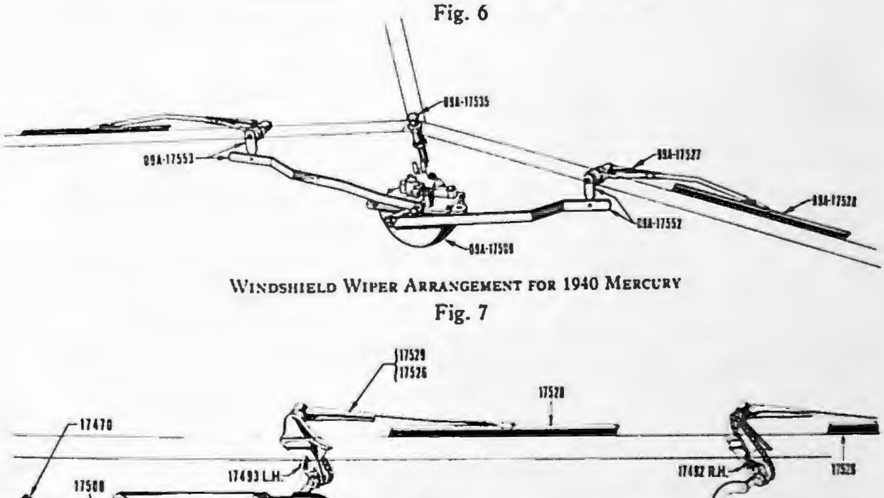
1938-39

Windshield Wiper (Cont.)

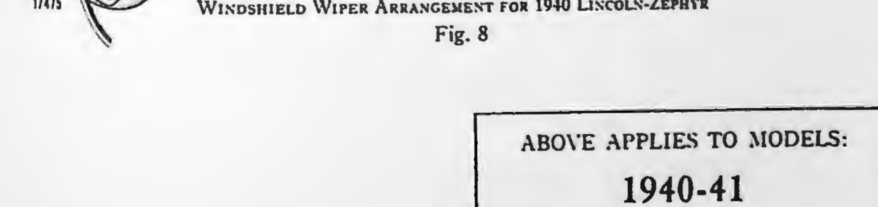
1940



WINDSHIELD WIPER ARRANGEMENT FOR 1940 FORD
Fig. 6



WINDSHIELD WIPER ARRANGEMENT FOR 1940 MERCURY
Fig. 7



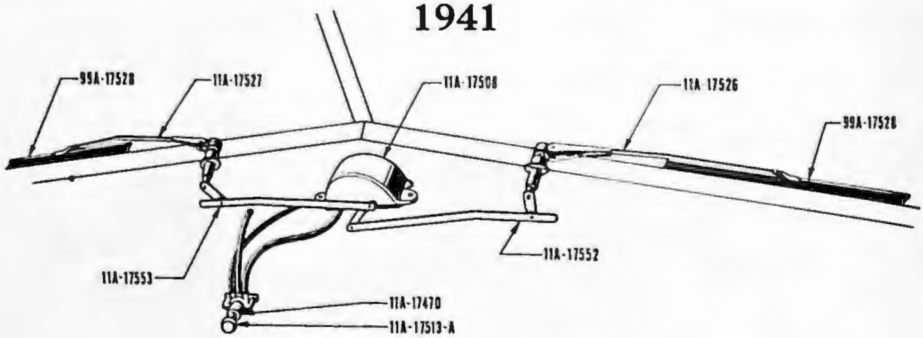
WINDSHIELD WIPER ARRANGEMENT FOR 1940 LINCOLN-ZEPHYR
Fig. 8

ABOVE APPLIES TO MODELS:
1940-41

Printed in U.S.A.

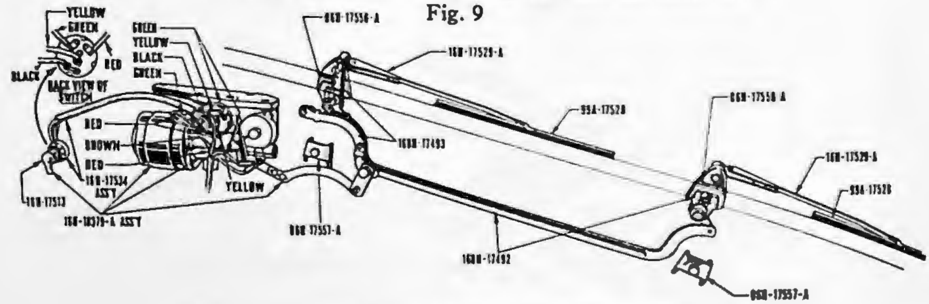
April 1, 1941

1941



WINDSHIELD WIPER ARRANGEMENT FOR 1941 FORD AND MERCURY

Fig. 9



ELECTRIC WINDSHIELD WIPER ARRANGEMENT FOR 1941 LINCOLN

Fig. 10

ABOVE APPLIES TO MODELS:
1940-41

April 1, 1941

Printed in U.S.A.

Radio Receiver Antenna Test

PRELIMINARY.

The instructions, as well as drawings showing the proper hook-up to check for an open or shorted antenna, are given in the following pars. a and b below. These tests are performed with the use of the ignition dwell circuit provided in the diagnosis test set. If the antenna is found to have a short or an open circuit, see subpars. *(a)* and *(b)* under Symptom 18999-B.

a. Antenna Short Circuit Test.

Set the voltmeter selector switch to the No. 6 position (ignition dwell) (fig. 1). Connect the "IGN DWELL" leads (voltmeter leads) together and adjust the knob under "IGNITION" to read 100 per cent dwell (or "0" ohms). Clip one of the voltmeter leads to the car chassis or body at any point which is clear of paint or grease, preferably the windshield wiper arm. Clip the other voltmeter lead to the antenna rod. No reading ("0" on the top scale) indicates the antenna is not shorted. Any reading indicates a defective antenna.

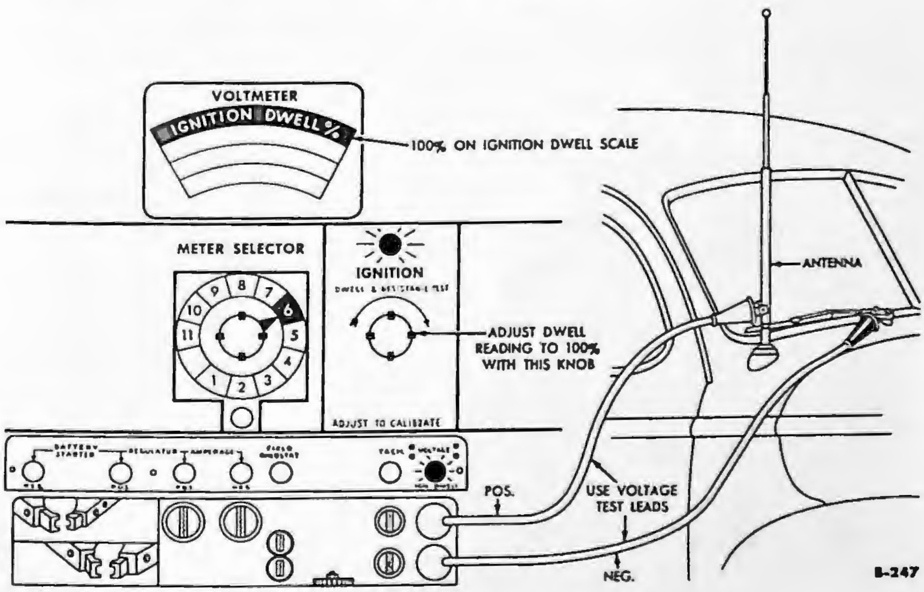


Fig. 1—Antenna Short Circuit Test

b. Antenna Open Circuit Test.

Set the voltmeter selector switch to the No. 6 position (ignition dwell) (fig. 2). Connect the "IGN DWELL" leads (voltmeter leads) together and adjust the knob under "IGNITION" to read 100 per cent dwell (or "0" ohms). Disconnect the antenna lead from the radio receiver by pulling out the plug at the radio receiver. Be sure the tip end of the antenna lead-in wire does not touch anything. Clip one of the voltmeter leads to the small tip of the antenna lead-in wire and the other voltmeter lead to the antenna rod. A good antenna will read full scale ("0" ohms). Any reading other than full scale, indicates that the antenna is defective.

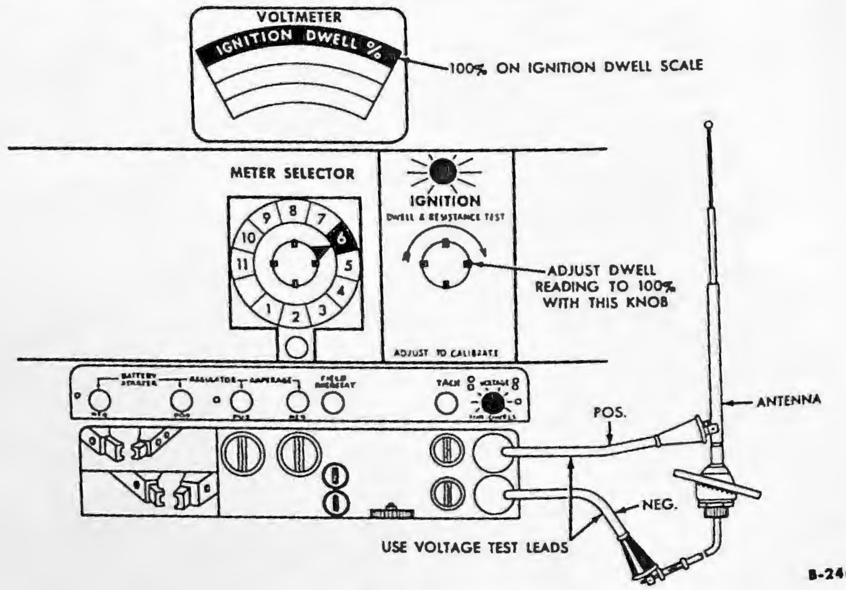


Fig. 2—Antenna Open Circuit Test

CARS TRUCKS BUSSES

DEALERS'
SERVICE BULLETIN

Ford Mercury Lincoln

Radio Receiver Volt-Amp Test

PRELIMINARY.

In order to determine the true condition of a radio receiver it is necessary to make a volt-amp test. This test is made with the use of the diagnosis test set. The procedure, as well as a drawing showing how to hook up the diagnosis test set to the radio receiver, is given in par. a below.

a. Volt-amp Test.

Set the ammeter selector switch to No. 3 position (50 amps) (fig. 1). Set the voltmeter selector switch to No. 2 position (9 volts). Connect the test set leads, as shown in fig. 1, for bench test of complete radio receiver. The correct meter readings are given in radio receiver service bulletins and manuals for the particular model radio receiver being tested.

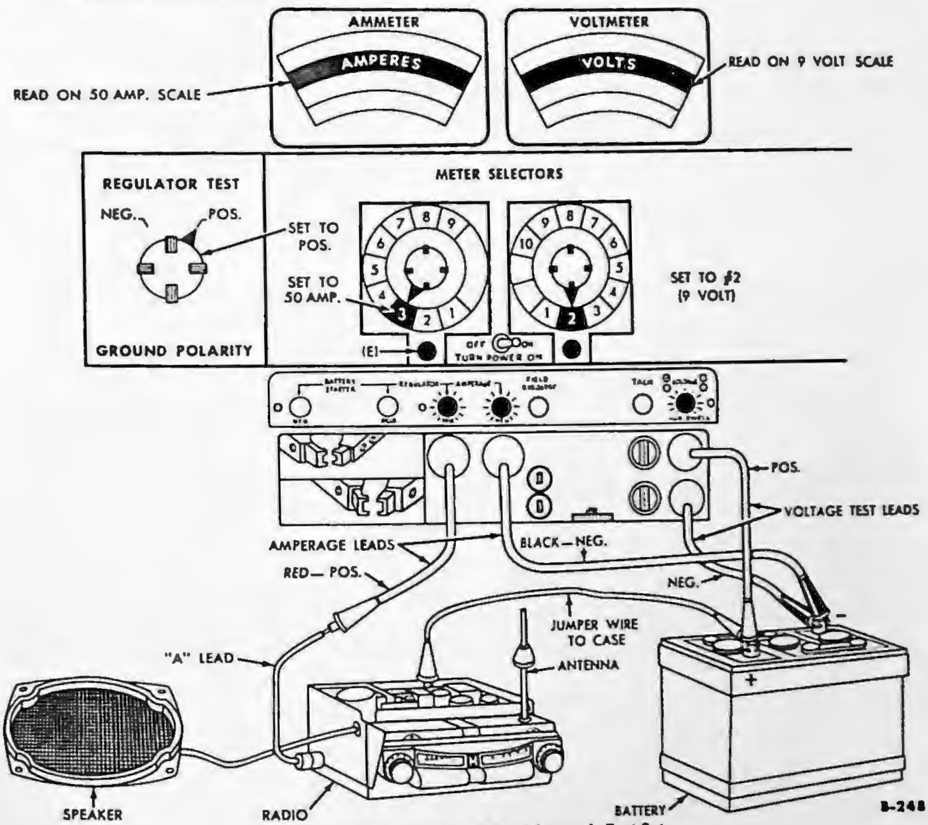


Fig. 1—Volt-amp Test Using Diagnosis Test Set

PRINTED IN U.S.A.

February 28, 1948

There is no need for guesswork and "come back" jobs if you follow the full recommended procedures exactly.

Symptom 18999-A

No Reception

a. Preliminary Instructions.

Before proceeding with the following symptom, remove the fuse to determine if it is good or is burned out. If the fuse is burned out, proceed with subpar. (1) below. If the fuse is found to be good, proceed with subpar. (2) below.

(1) *FUSE BURNED OUT*. Remove the radio receiver from the car. Remove the top cover from the radio receiver. Replace the vibrator (see fig. 2). With the radio receiver on a test bench, hook up the battery leads and test set as shown in fig. 1. Turn the radio receiver on, and observe the ammeter of the test set. The normal current is 6.0 to 6.5 amperes with the voltmeter reading 6.0 volts. If there is no reception, feel the vibrator and if there is no evidence of its operating, substitute another vibrator. If the current and voltage are nearly normal but the radio receiver is still inoperative, proceed with subpar. (2) *(a)* below.

(2) *FUSE O.K.* Turn the radio receiver on, and feel the bottom of the radio receiver for vibration. If vibration can be felt and there is no reception, test for shorted or open antenna. (See subject 18805). Repair or replace the antenna if necessary. If there is still no reception, remove the radio receiver and remove the top cover. With the radio receiver on a test bench, hook up the battery leads and test set as shown in fig. 1. Turn the volume control fully on, and tune to the approximate point of a local station. Observe the ammeter, and follow whichever of the following conditions that apply.

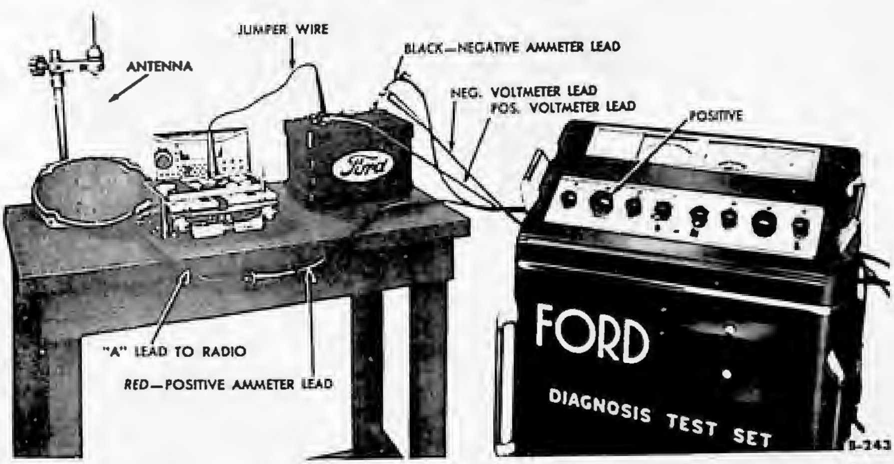


Fig. 1—Bench Test Connection, Using Diagnosis Test Set

(a) Current Low. If the current is below 5 amperes and no vibration noise is evident, replace the vibrator (fig. 2). Connect the antenna. Push all the tubes down firmly in their sockets. If a visual inspection does not reveal any unusual condition, substitute new tubes in the following order: 7Y4, 7C5, 7B6, 7A7, 7B8, 7A7, allowing one minute for each new tube to warm up. Replace one tube at a time until the defective tube is located and the radio receiver operates satisfactorily.

NOTE: ***If the above procedure does not restore the radio receiver to normal operation, send it to an authorized radio shop for correction.***

(b) Current Normal. The current is considered normal if it is between 6.0 and 6.5 amperes, and the voltage is 6 volts.

(c) Current High. If the current is between 35 and 50 amperes, inspect the "A" lead for a short against the case (fig. 2). Tape up any bare spots or where there is worn insulation, and inspect the fuse holder for broken insulators. If the current is between 7 and 10 amperes, the buffer condenser is at fault, and the radio receiver should be sent to an authorized radio shop for repair.

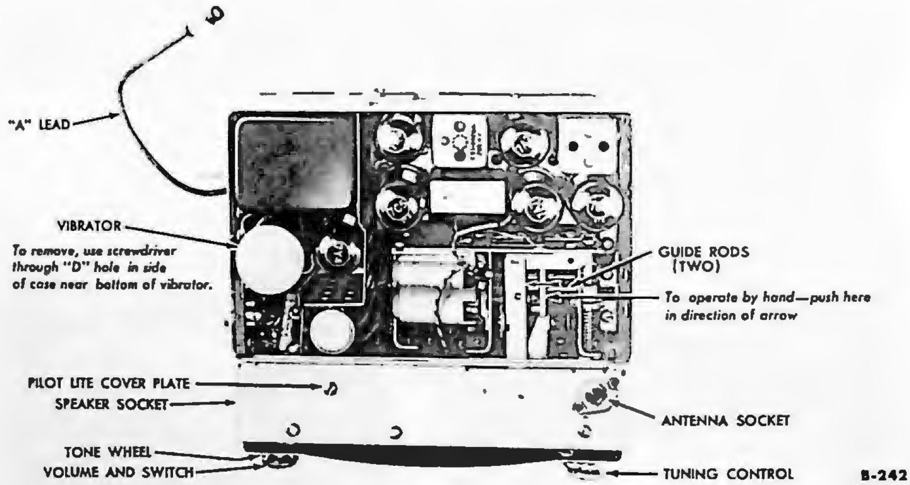


Fig. 2—Interior View of Radio Receiver with Top Cover Removed

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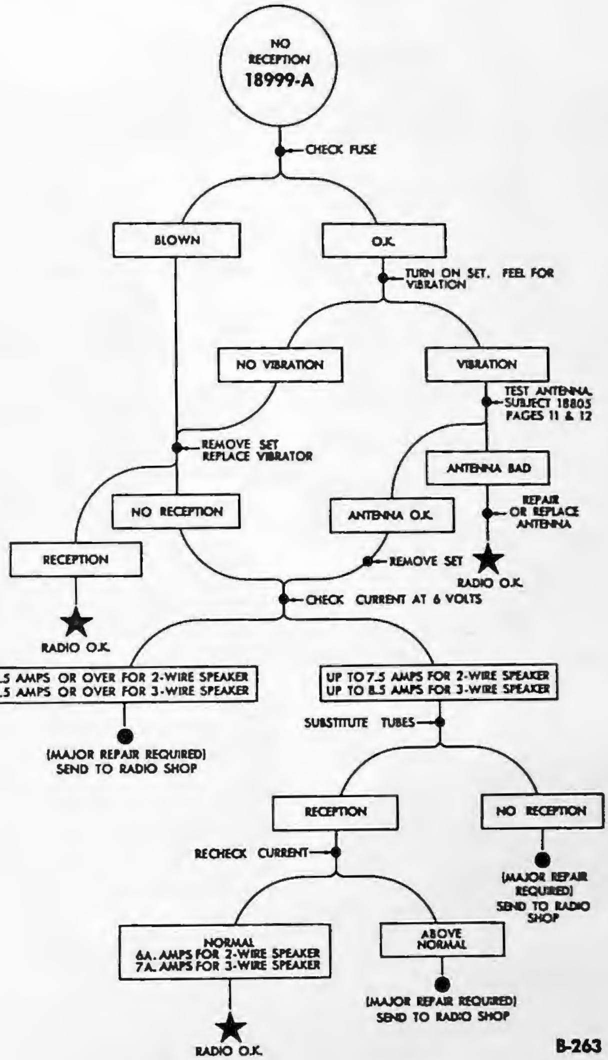

Fig. 3—Road Map Used with Symptom 18999-A

Symptom 18999-B

Plays Weakly, Can Tune in Only Few Stations

a. Preliminary Instructions.

Some of the most common causes for this failure are an open or shorted antenna, or an antenna trimmer that is out of adjustment.

If the following procedure does not bring the reception back to normal, send the radio receiver to an authorized radio shop for complete alignment, as special equipment is required.

(1) *TEST ANTENNA.* To test for an open or shorted antenna, see subject 18805. If the antenna test indicates an open circuit, check for a broken conductor in the antenna lead-in wire or for rosin in the connector or coupling at either end of the lead-in wire. Repair or replace antenna.

If the antenna indicates a short circuit, proceed as follows (subpars. *(a)* or *(b)* below):

(a) *Closed Car Antenna.* Check for a short at the rear view mirror to make sure the moulding is not touching the nut. Check for short caused by broken bushings at the top or bottom of the roof tube, or a defective lead-in wire.

(b) *Open Car Antenna.* Check the lead-in wire for metal shavings in the connector cup or water soaked insulators. To determine if either the lead-in wire or antenna rod is defective, disconnect the lead-in wire from the antenna rod and test separately. Replace whichever is defective or relieve the short by reinstalling.

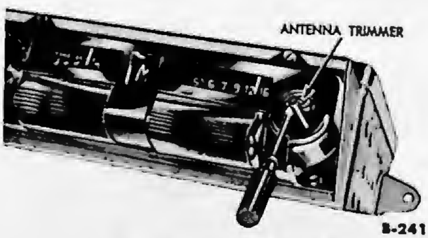

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Fig. 4—Antenna "Trimmer"

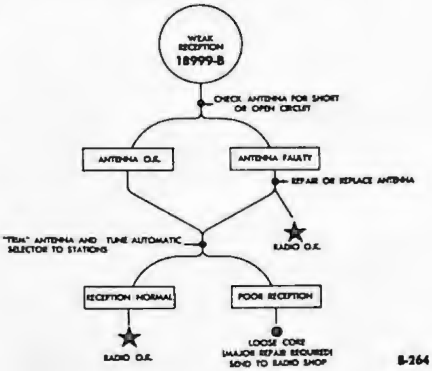

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Fig. 5—Road Map Used with Symptom 18999-B

(2) *"TRIM" ANTENNA.* Turn the radio receiver on to full volume and allow it to operate for 5 to 10 minutes. Set the tone control to the "high" position. Tune in the weakest station to be heard between 12 and 16 on the dial. This is important, as a loud station will not permit accurate adjustment. Remove the tuning knob and, with a small screwdriver, turn the trimmer screw (see fig. 4) first in one direction and then in the opposite direction until the station comes in the loudest. If a peak of reception cannot be obtained by adjusting the trimmer screw, either the station tuned in is too strong, or the antenna is defective. If necessary, repeat the antenna test (subject 18805).

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Symptom 18999-C

Noisy and Intermittent Reception While Driving

a. Preliminary Instructions.

Turn the radio receiver on. With the engine not running, jar the radio receiver and antenna by bumping the bottom of the radio receiver with the hand.

CAUTION: ***Do not use a rubber mallet or hammer to jar the radio receiver.***

If a noise is produced while jarring the radio receiver, proceed with subpars. (1) and (2) below. If no noise is evident, proceed with subpar. (3) below.

(1) *TEST ANTENNA.* Test for open or shorted antenna. (See subject 18805). If the antenna test indicates an open circuit, check for broken conductor in the antenna lead-in wire or for rosin in the connector or coupling at either end of the lead-in wire. Repair or replace the antenna.

If the antenna indicates a short circuit, proceed as follows (subpars. *(a)* or *(b)* below):

(a) CLOSED CAR ANTENNA. Check for a short at the rear view mirror to make sure the moulding is not touching the nut. Check for a short caused by broken bushings at the top or bottom of the roof tube or a defective lead-in wire.

(b) OPEN CAR ANTENNA. Check the lead-in wire for metal shavings in the connector cup or water soaked insulators. To determine if either the lead-in wire or antenna rod is defective, disconnect the lead-in wire from the antenna rod and test separately. Replace whichever is defective or relieve the short by reinstalling.

(2) *TEST TUBES.* Remove the radio receiver. Remove the top cover from the radio receiver. Make sure that each tube is seated firmly in its socket. With the radio receiver on a test bench, connect the battery leads and test set as shown in fig. 1. Turn the radio receiver on to full volume. Tap the top of each tube with the finger.

CAUTION: ***Never use a screwdriver handle or similar object to tap the tubes. Good tubes may be damaged by tapping them too hard.***

This will locate any defective tube. Replace with a new tube and continue the tapping until no disturbance is evident from the tubes. If the noise persists after substituting each tube and no loose connections can be seen, the trouble is elsewhere, and the radio receiver should be sent to an authorized radio shop.

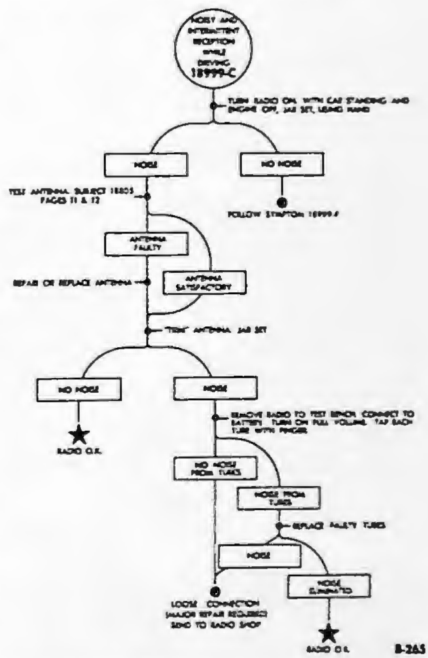

Fig. 6—Road Map Used with Symptom 18999-C

(3) *IGNITION INTERFERENCE OR TIRE STATIC.* If jarring the radio receiver and the antenna while the radio receiver is operating, does not produce noise in the speaker, the source of the noise may be ignition interference or tire static. (See symptom 18999-F)

Symptom 18999-D

Distorted Tone Quality and Loss of Volume (O.K. With Engine Off or Idling)

a. Preliminary Instructions.

Distorted tone quality and loss of volume after 15 to 45 minutes of driving usually is due to a defective 7C5 tube or 7C5 bias resistor.

If the following procedure does not bring the reception back to normal, send the radio receiver to an authorized radio shop.

NOTE: *If changing the 7C5 tube corrects the trouble, be sure to check and correct the generator regulator voltage setting on the car before reinstalling the radio receiver.*

(1) *REMOVE RADIO RECEIVER.* Remove the radio receiver. With the radio receiver on a test bench, connect as shown in fig. 1, except that an 8-volt battery must be used. This can be accomplished by using two batteries and connecting one cell of one battery to the battery already used as shown in fig. 7. Turn the radio receiver on and tune in a station. Allow the radio receiver to operate until distortion occurs. This should be evident after 5 to 45 minutes. If distortion is evident, proceed with subpar. *(a)* below.

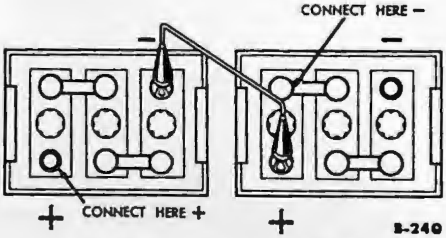

Fig. 7—Series Connected Batteries

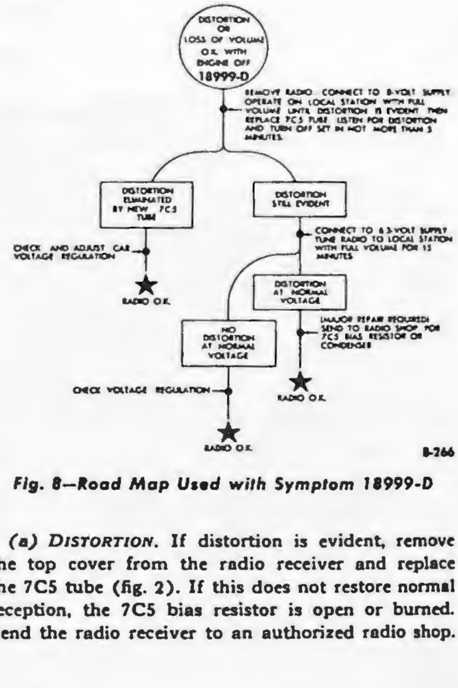

Fig. 8—Road Map Used with Symptom 18999-D

(a) DISTORTION. If distortion is evident, remove the top cover from the radio receiver and replace the 7C5 tube (fig. 2). If this does not restore normal reception, the 7C5 bias resistor is open or burned. Send the radio receiver to an authorized radio shop.

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Symptom 18999-E

Automatic Tuning Does Not Operate

a. Preliminary Instructions.

The trouble encountered in this symptom is usually caused by one or more of the following:

Jammed, due to knob on too close.
Tuning shaft bent.
No oil, or dry slide bar.
Broken ratchet.
Broken ratchet and bracket assembly.

Follow the procedure in the order given below to correct the cause.

(1) *CHECK POSITION OF TUNING KNOB.* Inspect the position and condition of the tuning knob. If the tuning knob has less than $\frac{1}{16}$ inch clearance between the knob and escutcheon, loosen the set screw in the knob and move the knob out until $\frac{1}{16}$ inch clearance is obtained. The plastic and metal parts of the knob may separate, causing the knob width to be excessive. Replace if necessary.

(2) *CHECK FOR BENT TUNING SHAFT.* Turn the tuning shaft. If it binds against the escutcheon, remove the knob and bend the tuning shaft until it turns freely.

(3) *CHECK SLIDE BAR.* Dry slide bars (fig. 2) will cause sluggish action or will jam the mechanical action of the tuner. Clean with gasoline or carbon tetrachloride, and oil with one drop of clock oil or light machine oil.

(4) *CHECK RATCHET GEAR.* Breakage of this part is indicated by random indexing of the numbers on the indicator drum. Repair is a major operation and should be accomplished at an authorized radio shop.

(5) *CHECK RATCHET AND BRACKET ASSEMBLY.* This is indicated by the same symptom as (4) above. Repair is also a major operation.

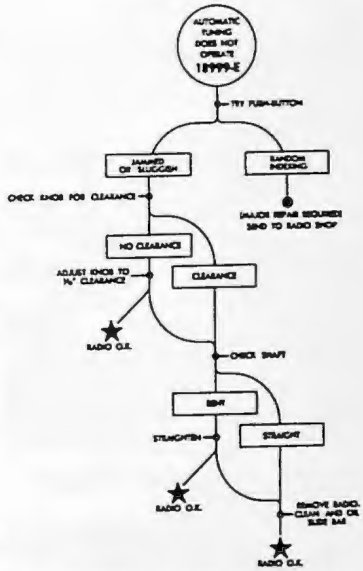

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Fig. 9—Road Map Used with Symptom 18999-E

Symptom 18999-F

Ignition Interference and Tire Static

PRELIMINARY.

Interference or noise in radio receiver reception is divided into several broad classifications.

(1) Interference created by spark plugs firing, gauges (temperature, fuel, and oil) and the sending units of the gauges.

(2) Outside interference, such as power lines, fluorescent lights, and other cars in the immediate vicinity, which are not properly suppressed.

(3) Static electricity developed by friction of the tires on the road and static charges developed by the car passing through the air at high speeds.

By following the procedures given in the following pars., most of these troubles can be corrected.

a. Ignition Interference.

Ignition interference may get into an auto radio receiver through either the antenna, the battery lead ("A" lead) or through the case of the radio receiver. However, a well designed auto radio receiver will not have "case leakage," so that route will not be considered here.

In order to correct ignition interference, follow the procedure in the order given below.

NOTE: ***Before performing the following procedure, move the car away from any high tension lines so that interference is at a minimum.***

(1) *CHECK ELECTRICALLY OPERATED ACCESSORIES.* With the engine running, tune the radio receiver to an in-between station position and operate it with the volume fully on. Disconnect all electrically operated accessories such as a lighted compass, spotlight, etc. If an improvement is noticed (a reduction in noise), connect a suppression condenser to the battery connection on which the wire to the accessories is connected, and bolt the condenser to the car body. If no accessory is causing the interference, check the antenna (subpar. (2) below).

(2) *CHECK ANTENNA.* Disconnect the antenna from the radio receiver by pulling out the connector at the radio receiver. If the interference is eliminated by doing this, the antenna is picking up the noise. Plug the antenna back into the radio receiver before proceeding. Re-locate the lead-in wire from the antenna to the radio receiver, keeping it as far away as possible from other wires.

Be sure there are no breaks in the covering of the lead-in wire, and that it is not spliced.

Make sure the lead-in wire, which comes through the cowl or side panel, is securely fastened to the body of the antenna as this grounds the shielding. If the lead-in wire is in order and no change in noise level is noticed, proceed with subpar. (3) below.

(3) *CHECK BOND CLIPS.* Check the hood bonding clips and the hood latch for contact. Clean away rust, paint, or grease.

NOTE: ***On Ford "closed car" antenna installation, the cause of most antenna engine noise is lack of a grounding bond between the upper end of the inside center windshield trim moulding and the top of the car. A piece of copper braid or bare wire may be inserted under this trim moulding, and fastened under a screw holding the mirror bracket. In stubborn cases, a battery ground strap from the front engine support to the frame will be effective.***

b. Gauge Noise.

Intermittent contact of gauge and sending units cause crackling noises in the radio receiver which can be reduced to a satisfactory level by connecting a suppression condenser from the gauge or sending unit terminal to the engine block or body.

The equipment supplied with the radio receiver is usually sufficient to eliminate all objectionable noises from this source if properly installed. However, if noise persists, proceed as follows in subpar. (1) below.

(1) *DISCONNECT GAUGES.* Disconnecting each gauge in turn will locate which gauge is responsible for the noise and where to put the suppression condenser. If the gauge is already equipped with a suppression condenser, it is considered good practice in each case to test the suppression condenser either by substitution or on the laboratory test set in the same manner as an ignition condenser is tested, except that the values vary from 1.0 mfd down to 0.1 mfd capacity.

c. Outside Interference.

Street cars, neon signs, fluorescent lights, and power lines create radio receiver interference which is much more noticeable in auto radio receivers than in home radio receivers, due to the mobility and constantly changing position of the auto radio receiver. This

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interference can be reduced considerably by following the procedure given in subpar. (1) below.

(1) *TRIM ANTENNA.* Turn the radio receiver on to full volume, and allow to operate for 5 to 10 minutes. Set the tone control to the "high" position. Tune in the weakest station to be heard, between 12 and 16 on the dial. This is important, as a loud station will not allow accurate adjustment. Remove the tuning knob and, with a small screwdriver, turn the trimmer screw (fig. 4) first in one direction and then in the opposite direction until the station comes in the loudest. If the interference has not reduced, proceed with subpar. (2) below.

(2) *ADJUST AUTOMATIC STATION SELECTOR.* See Owner's Manual.

NOTE: ***Broadcasts from out-of-town stations or distant stations will be difficult to receive in the proximity of loud local disturbances such as listed above. Customers are not always aware of these conditions, and an explanation will usually assist them to understand and not to expect the impossible.***

d. Tire Static or Wind Static.

With the advent of synthetic tires and very sensitive radio receivers, a condition develops which causes severe interference with radio receiver reception. This interference, or noise, is created by the motion of the car through the air and is noticed mostly on dry days. Hard road surfaces, such as pavement or concrete, also cause static. Dirt and gravel roads rarely cause static to build up to the point where it is noticeable.

The usual complaint is that on some days on some roads, static in radio receiver reception is very bad although no thunderstorms or lightning are near, and when the car is stopped, the noise also stops. Several remedies can be used as outlined in subpars. (1) and (2) below.

(1) *TIRE STATIC.* Tire static can be corrected by injecting an anti-static powder compound into the inner tube of all tires. This compound is prepared by various tire and rubber manufacturers. Ford Anti-Static Compound is obtainable through accessory sales in package form complete with instructions. The material is very effective and the method of injection into the tube is quite simple.

(2) *CHECK ANTENNA.* Another cause of static or noisy reception may be due to the loss of the small ball from the end of the antenna rod. The ball should fit tightly on the rod.

Loose sections of the antenna extension rods may also be a source of interference due to poor electrical contact.

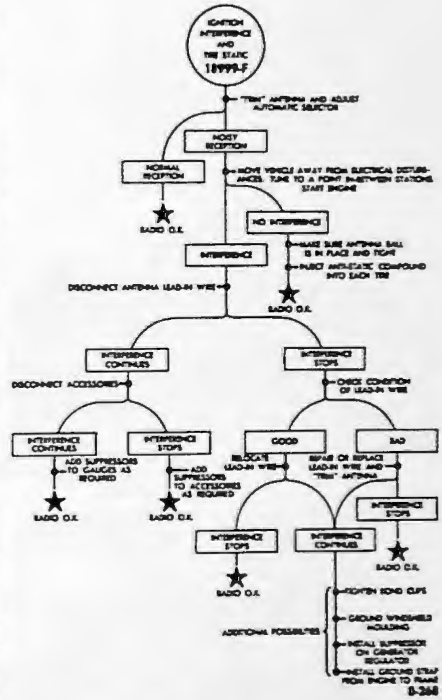

Fig. 10—Road Map Used with Symptom 18999-F

Symptom 18999-F

Ignition Interference and Tire Static

PRELIMINARY.

Interference or noise in radio receiver reception is divided into several broad classifications.

(1) Interference created by spark plugs firing, gauges (temperature, fuel, and oil) and the sending units of the gauges.

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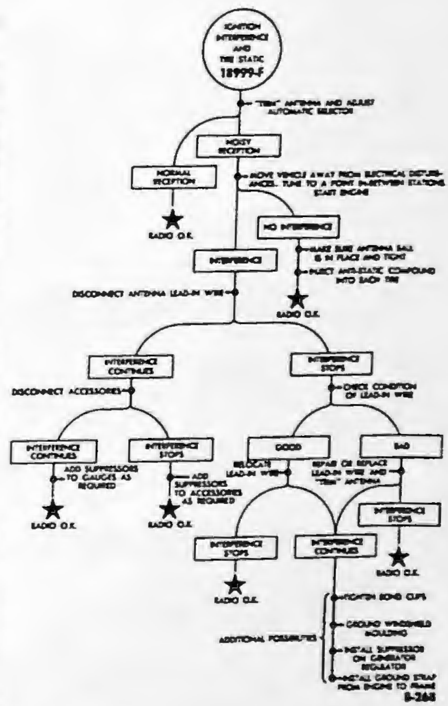


Fig. 10—Road Map Used with Symptom 18999-F

Good service is quick service, for if the owner's loss of time offsets the value of good work performed, he is not getting good service.

December 7, 1947

Hydro-Electric Top and Windows System

1. OPERATION

a. Operation of Windows.

The hydraulic operation of the windows in the Ford Sportsman Convertible is accomplished by an internal rotor type fluid pump, mounted on the dash. This pump is driven by a unit adapted from the standard passenger car starting motor. Control of the windows is through a three-position electrical switch mounted on the door and quarter trim panels, with a block of switches on the left door trim panel for control of all windows by the driver.

The opening of the window is accomplished through spring tension. When the toggle switch is pushed downward, just the cylinder solenoid, not the motor, is actuated, opening the valve at the bottom of the cylinder and allowing the return spring tension on the regulator arm to force the fluid out of the cylinder and back into the pump reservoir.

The system is inoperative with the switch in the center position.

To close the window the three-position toggle switch is pushed upward making simultaneous electrical contact with the pump motor solenoid and a solenoid located at the bottom of the actuating cylinder.

The cylinder solenoid operates a valve, which is normally closed to prevent the flow of fluid into or from the actuating cylinder, until the individual switch is closed. This arrangement allows each window to be operated separately.

b. Operation of Top.

The top is operated by the same pump and motor as the windows. However, the top mechanism uses a three-position manual control (instead of electrical switch), mounted on the dash. A two-directional actuating cylinder is used, the manual valve merely directing the flow of fluid to the top of the cylinders when lowering the top, and to the bottom of the cylinders when raising the top. By this means a constant pressure is maintained on either one side or the other of the top operating cylinder pistons. As the center position of the manual control valve closes off all inlets and outlets to and from the cylinders, the top is not affected when the windows are raised or lowered.

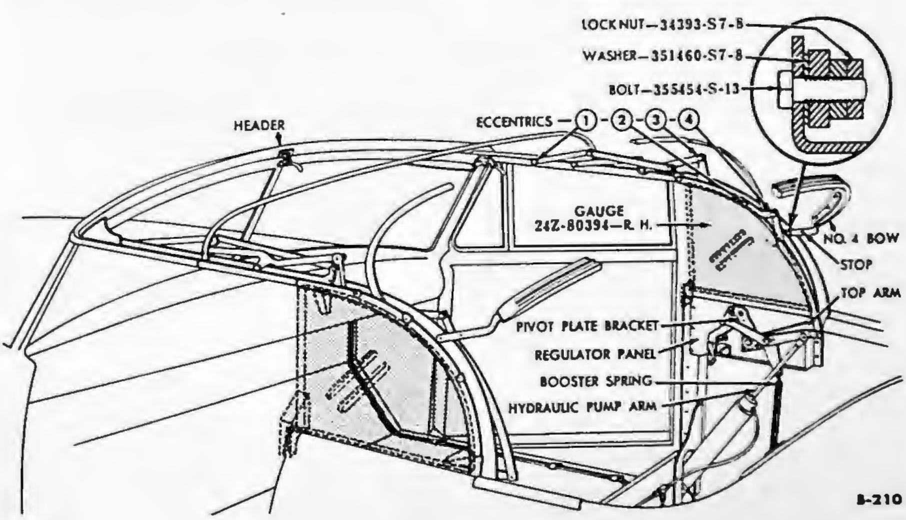


Fig. 1—Convertible Top Alignment and Adjustment

July 27, 1947

2. MAINTENANCE

a. Fluid.

As the system is an open instead of an enclosed system, it is self-bleeding. This applies to both the top and window systems. The fluid return is directly to the pump reservoir, which is vented to the atmosphere. In this type of system the level in the reservoir must be checked with the windows down so that all possible fluid is displaced to the reservoir. After filling to the proper level with M-4835 Fluid, the windows and top should be operated several times and the level in the reservoir rechecked.

b. Lubrication.

Light engine oil should be applied each fall to the pump motor shaft end at the point provided. A light grease may be used on window regulators and top joints as well as cylinder anchors, but this is seldom necessary as the original lubrication should last indefinitely. CAUTION: *Under no circumstances should any solvents or mineral oil be used on the piston rod, upper seal, valves, or internal parts of the pump, as this will cause rubber seals and valves to swell. A few drops of castor oil or brake fluid may be used.*

If the electrical contacts, pump motor, and fluid are kept clean, a minimum of service will be required.

c. Alignment and Assembly of Model 76 Top.

NOTE: *The gauge, shown in fig. 1, to align the top can be made from ¼-inch plywood. Fig. 2 shows a scale drawing of this gauge.*

Temporarily secure the pivot plate bracket to the regulator panel with the tapping plates as shown in fig. 1. Secure the top arm to the pivot plate assembly. Fasten the top to the header over the windshield. Place the gauge in position as shown in fig. 1. This permits and regulates the aligning of arms, channels, and slats. If necessary, adjust the eccentrics to correct the alignment. Usually the eccentric adjustment is not necessary, as slack can be taken up when the pivot plate is adjusted to its final position and made secure to the regulator panel. The final step in fastening the pivot bracket assembly is made by drilling two holes in the regulator panel, using the two locating holes in the pivot plate as a guide. Secure the pivot bracket to the regulator panel with two screws (32793-S). A last check and tightening of all bolts is recommended before connecting hydraulic arm and booster spring.

NOTE: *Before lowering the top, the No. 4 bow (fig. 1) must be checked, and, if necessary, adjusted, so that it will have free movement. This bow must fall by its own weight when the top is being lowered. The best way to check the free movement of this bow is to lower the top sufficiently so that the top material will have plenty of slack. Move the bow to check if it is binding. If the bow is binding, the bolt (355454-S-13) must be relieved sufficiently to allow the bow to drop by its own weight and rest against the stop. Make sure the flat washer is assembled between the slat iron and rear folding arm.*

3. TROUBLE SHOOTING

a. Operation–Sluggish or Slow.

When the operation of the windows or top is slow or sluggish, check the fluid level. In cold weather the fluid may become slightly congealed, causing slow passage of the fluid through the pump lines and cylinder valves. This same condition may arise from the fluid not being changed and the system flushed at regular intervals.

As this system is vented to atmosphere, dust-laden air can enter the system causing the fluid to become thick and gummy, resulting in slow or sluggish operation, or failure of the system to operate altogether. It is recommended that each fall with all windows lowered, the fluid should be drained, the system flushed with alcohol, and refilled with M-4835 brake fluid.

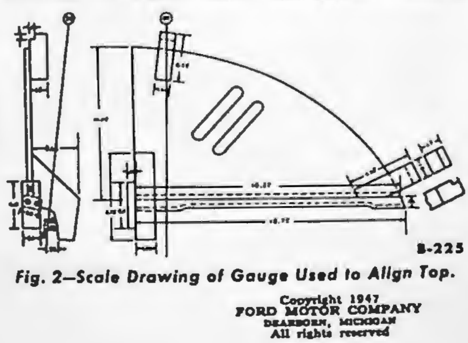
b. Incomplete Operation.

When windows will not close completely, or top will not raise or lower fully, check the level of the fluid in the reservoir with all windows lowered. If the level is O.K. and no obstructions in the window channels or the top frame can be found, check the pump output pressure and if necessary adjust the pressure regulator valve.

CAUTION: *The regulator valve is located at the pump outlet and is a spring loaded piston type relief valve. It is preadjusted to a maximum fluid pressure of 210 pounds per square inch. If adjustment is necessary, under no circumstances should this pressure be exceeded.*

c. Electrical Failures.

In the event that one window fails to operate, or two or more windows operate at the same time, check the electrical wiring from the control switches to the solenoids for a short circuit, and the solenoids for proper operation. In the event that the top and windows do not operate at all, check the control switches, solenoid, and pump motor brushes and armature for a short circuit and proper operation.



B-225

Fig. 2—Scale Drawing of Gauge Used to Align Top.

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AUTOMATIC TOP

The automatic top on the convertible coupe models of the DeLuxe Ford, Mercury and Lincoln-Zephyr is operated by utilizing the vacuum developed in the engine intake manifold when the engine is running.

The top itself is much the same as the manually operated type top, with the linkage arranged to receive the piston rod from the operating cylinders. Figure 1 is a drawing of the mechanism. The power unit consists of two vacuum cylinders, 4½" in diameter, and with a 11⅜" stroke, one at each end of the rear seat between the inner body trim and the outer body metal.

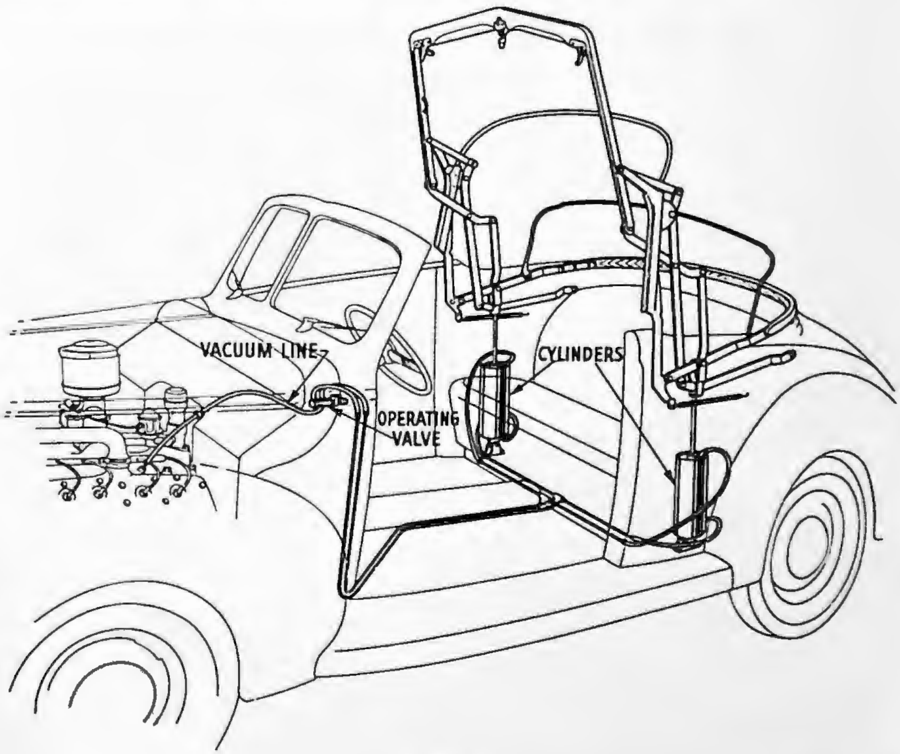

Fig. 1

ABOVE APPLIES TO MODELS:

STARTING 1940

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May 7, 1940

The trim is easily removed for service and inspection. Pipes, ¼" inside diameter, are connected to both the bottom and top of the cylinder, thus permitting the application of power on either side of the piston for up or down motion.

These two pipe lines run from the vacuum cylinders to a control valve at the left of the steering column just below the instrument panel.

This control valve is held in a neutral position by a spring, and when pushed inward, permits the vacuum to be applied to the top of the cylinder causing the piston to rise, pushing the top up. When pulled outward, it permits the vacuum to be applied to the bottom of the cylinder, causing the piston to move down, in turn pulling the top down.

The main supply line, ¼" inside diameter, runs from a fitting on the engine intake manifold to the control valve.

OPERATING INSTRUCTIONS

TO LOWER THE TOP: (Engine running)

1 Unhook the three latches at the top of the windshield on each side and in the center and push the front of the top up about an inch so as to free it from the windshield header dowels.

2 Pull the control valve out and hold it until the top is completely lowered. The fasteners at each side along the lower edge of the top will automatically release themselves without attention as the top lowers. The windows may be in either the up or down position when the top is operated.

TO RAISE THE TOP:

1 Push the control valve in and hold it until the top is completely raised to within an inch or two of closing completely at the windshield.

2 Pull the top closed and fasten the three toggle latches which will pull the top front header over the dowels and hold it securely in place.

3 Snap the fasteners in place along the lower edges of the top.

If the top is to be left down for long periods, it is advisable to cover it with the boot. This will prevent the accumulation of dirt and dust which would make the top appear streaky when raised.

Do not operate the top when the car is in motion. Any such operation may cause damage to the top and may cause the car to swerve on the road.

ABOVE APPLIES TO MODELS:

STARTING 1940

Wood Parts Repair

When making repairs to the doors, quarter frame, or luggage compartment door, the assembly must be removed from the body.

1. Sportsman Convertible

This section contains the procedure for the repair of the doors, quarter frames, and luggage compartment door.

a. Door.

The following pars. apply to the repair of either the right hand or the left hand door.

(1) *LOCK PILLAR OR HINGE PILLAR REPLACEMENT* (fig. 1). Remove the hardware, glass, and trim necessary to remove the wood assembly from the steel panel. Remove the wood assembly from the steel panel. Saw through the lock pillar or hinge pillar at the belt rail and bottom bar. Remove the screws from the joints and lining board. Remove the lock or hinge pillar from the belt rail, center bar and bottom bar. Install the new lock or hinge pillar, using glue on the joints. Place clamps on the joints until the glue is set. Install the screws in the joints. Assemble the wood assembly to the steel panel. Install the hardware, glass, and trim.

(2) *BELT RAIL OR BOTTOM BAR REPLACEMENT.* (fig.1). Remove the hardware, glass, and trim from the steel panel, and remove the wood assembly from the steel panel. Remove the screws from the joints and the lining boards. Saw through the belt rail or the bottom bar near the hinge pillar and lock pillar. Using a chisel, clean the hinge pillar and lock pillar joints. Install the new belt rail or bottom bar, using glue on the joints. Install clamps on the joints until the glue is set to ensure a tight joint. Install the screws in the joints and lining boards. Assemble the wood assembly to the steel panel, and install the hardware, glass, and trim.

(3) *CENTER BAR REPLACEMENT* (fig. 1). Remove the hardware, glass, and trim necessary to remove the wood assembly from the steel panel. Remove the wood assembly from the steel panel. Remove the lock or hinge pillar. Using a chisel, loosen the center bar from the lining board, being careful not to damage the lining board. Saw through the center bar near the hinge or lock pillar. Using a chisel, clean the joints. Install a new center bar and lock or hinge pillar, using glue on the joints. Install clamps on the joints until the glue is set. Install the screws in the joints. Assemble the wood assembly to the panel, and install the hardware, glass, and trim.

(4) *LINING BOARD REPLACEMENT* (fig. 1). Remove the hardware, glass, and trim necessary to remove the wood assembly from the steel panel, and remove the wood assembly from the steel panel. Remove the screws from the lining board. Using a chisel, loosen the lining board from the door assembly, and remove the lining board. Clean the rabbet joints, and install the new lining board, using glue on the joints. Install the lining board screws and assemble the wood assembly to the steel assembly. Install the hardware, glass, and trim.

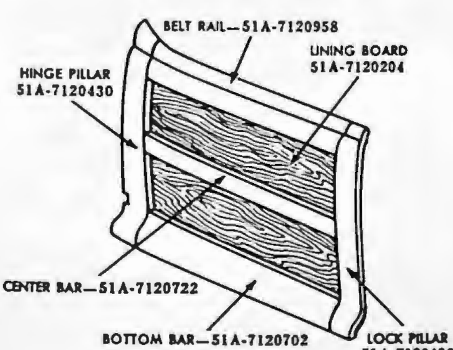

Fig. 1—Door Assembly

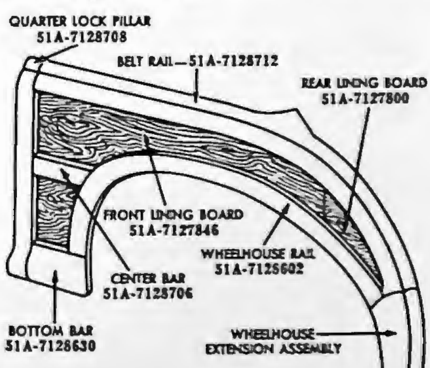

Fig. 2—Quarter Frame

b. Quarter Frame.

The following pars. apply to the repair of either the right hand quarter frame or the left hand quarter frame.

(1) *FRONT AND REAR LINING BOARD REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body, and remove the assembly from the body. Remove the screws from the lining board. Remove the splicer and the lining board. Clean the rabbet joints and install the new lining board, using glue on the joints. Install the splicer and screws. Assemble the wood assembly to the body, and install the hardware, glass, and trim.

(2) *BELT RAIL REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body. Remove the wood assembly from the body. Remove the screws from the lining board and the joints. Remove the reinforcement plate. Saw through the belt rail near the quarter frame, lock pillar, and above the wheelhouse extension assembly joints. Saw through the belt rail at several places. Using a chisel, remove the belt rail from the lining board, being careful not to damage the lining board. Clean the joints and install a new belt rail, using glue on the joints. Install the screws in the joint and lining board. Install the reinforcement plate and assemble the wood assembly to the body. Install the hardware, glass, and trim.

(3) *QUARTER FRAME LOCK PILLAR REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body, and remove the wood assembly from the body. Remove the screws from the lining board and joints. Saw through the quarter lock pillar near the belt rail and bottom bar, and on both sides of the center bar. Saw through the quarter lock pillar at several places. Using a chisel, remove the pillar from the lining board, being careful not to damage the lining board. Clean the joints, and install the new quarter lock pillar, using glue on the joints. Install clamps on the joints until the glue is set to ensure a tight joint. Install the screws in the lining board and joints. Install the hardware, glass, and trim.

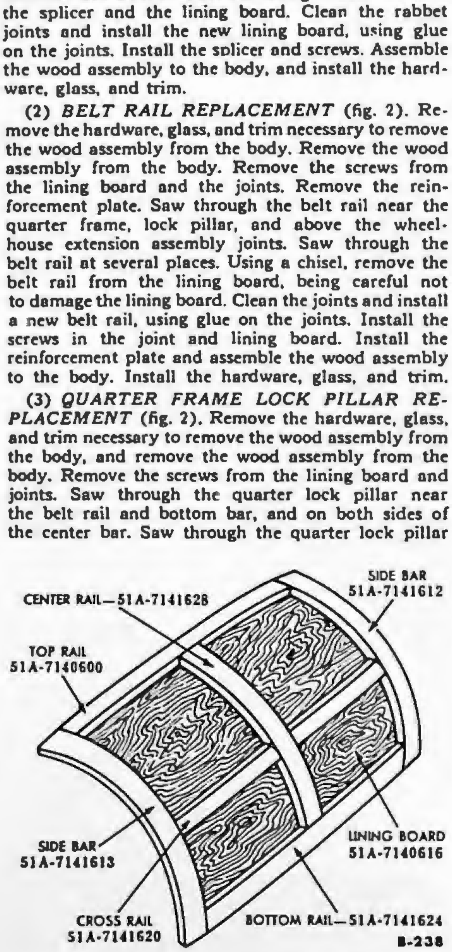

Fig. 3—Luggage Compartment Door

(4) *BOTTOM BAR REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body. Remove the wood assembly from the body. Remove the screws from the lining board and the joints. Saw through the bottom bar near the quarter lock pillar and the wheelhouse rail. Using a chisel, cut the bottom bar from the lining board (if necessary saw the bottom bar in short pieces). Clean the wheelhouse rail and quarter lock pillar. Install the new bottom bar using glue on the joints. Clamp each joint until the glue is set. Install the screws in the lining board and the joints. Assemble the wood assembly to the body, and install the hardware, glass, and trim.

(5) *CENTER BAR REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body. Remove the wood assembly from the body. Remove the screws from the lining board and the joints. Saw through the center bar near the quarter lock pillar and wheelhouse rail, being careful not to damage the lining board. Using a chisel, remove the center bar (if necessary, cut the center bar in small pieces), and clean the joints. Install the screws in the lining board and the joints, and assemble the wood panel to the body. Install the hardware, glass and trim. NOTE: *It will be necessary to cut off a portion of the tenon at the lock pillar end, and insert this end first when installing the center bar.*

(6) *WHEELHOUSE RAIL REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body. Remove the wood assembly from the body. Remove the screws from the lining board and joints. Saw through the wheelhouse rail near the bottom bar, wheelhouse extension assembly, and center bar. Saw the wheelhouse rail in small pieces, and, using a chisel, cut the wheelhouse rail from the lining board. Clean the joints, and install the new wheelhouse rail, using glue on the joints. Clamp the joints until the glue is set. Install the screws in the lining board and joints. Install the wood assembly to the body. Install the hardware, glass, and trim.

(7) *WHEELHOUSE EXTENSION ASSEMBLY REPLACEMENT* (fig. 2). Remove the hardware, glass, and trim necessary to remove the wood assembly from the body. Remove the wood assembly from the body and the steel reinforcement plate. Saw through the wheelhouse extension assembly just below the joint. Remove the screws from the joints. Clean the tenon with a chisel and a scraper. Install the new wheelhouse extension assembly, using glue on the joints.

Install the screws in the joints. Install the reinforcement plate. Install the wood assembly on the body. Install the hardware, glass, and trim.

c. Luggage Compartment Door.

The luggage compartment door wood part numbers are illustrated in fig. 3.

(1) *TOP RAIL OR BOTTOM RAIL REPLACEMENT* (fig. 3). Remove the hardware from the luggage compartment door. Remove the screws from the joints.

NOTE: ***It will be necessary to cut off the corners of the lining board and edge of the lining board at the center rail to remove the screws from the joints.***

Remove the screws from the lining board. Saw through the top rail or bottom rail near the side bars and at both sides of the center rail. Saw the top rail or the bottom rail into small pieces, and remove the pieces from the lining board, being careful not to damage the lining board. Clean the joints, and install the new top rail or bottom rail, using glue on the joints. Clamp the joints until the glue is set. Install the screws in the joints and lining board. Install the hardware. Use plastic filler to fill the corners at the center rail and lining board.

(2) *SIDE BAR REPLACEMENT* (fig. 3). Remove the hardware from the luggage compartment door. Remove the screws from the joints.

NOTE: ***It will be necessary to cut off the corners of the lining board and the edge of the lining board at the cross rail to remove the screws in the joints.***

Remove the screws from the lining board. Saw through the side bar near the top rail, bottom rail, and on both sides of the cross rail. Saw the side bar into small pieces, and remove them from the lining board, being careful not to damage the lining board. Clean the joints, and install the new side bar, using glue on the joints. Install the screws in the joints and lining board. Install the hardware. Use plastic filler to fill the corners at the edge of the lining board and cross rail.

(3) *CROSS RAIL REPLACEMENT* (fig. 3). Remove the hardware from the luggage compartment door. Remove the screws from the lining board. Cut a small hole in the lining board to remove the screw in the joint at the center rail. Saw through the cross rail near the side bar and center rail. Saw the cross rail in small pieces and remove them from the lining board, being careful not to damage the lining board. Using a chisel, clean the joint in the center rail. Saw the new cross rail joint off at the side bar, and install the new cross rail, using glue on the joint. Install the screw in the joint at the center rail and in the lining board. Drill two holes in the rabbet stand of the side bar and in the end of the cross rail, and install the dowel pins, using glue to secure them. Install the hardware. Fill the hole in the lining board with plastic filler.

(4) *CENTER RAIL REPLACEMENT* (fig. 3). Remove the hardware from the luggage compartment door. Remove the screws from the lining board. Cut small holes in the lining board to remove the screws from the joints at the cross bars. Saw through the center rail at the top rail, bottom rail, and on both sides of the cross rails. Saw the center rail into small pieces, and remove them from the lining board, being careful not to damage the lining board. Clean the joints, and install the new center rail, using glue on the joints. Install the screws in the joints and the lining board. Install the hardware, and fill the holes in the lining board with plastic filler.

(5) *LINING BOARD REPLACEMENT* (fig. 3). Remove the hardware from the luggage compartment door. Remove the screws from the lining board and remove the lining board. Using a chisel, clean the rabbet joints and parts where the lining board was glued. Install the new lining board, using glue on the joints. Install the screws and hardware.

2. Station Wagon

The Station Wagon wood body repair procedure is similar to the Sportsman convertible wood body repair procedure.

a. Front Door.

The following pars. apply to the repair of either the right hand door or the left hand door.

(1) *HINGE PILLAR AND HEADER BAR ASSEMBLY REPLACEMENT (fig. 1).* Remove the inner lining board, hardware, glass, and inner belt rail. Saw through the pillar just above the belt rail. Remove the screws that secure the joints, work the header bar up and down to break the joint, and remove the header bar. Knock the hinge pillar off, being careful not to damage the lining board, belt rail, and center bar. To install, clean the tenons and assemble the new hinge pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Replace the hardware, inner belt rail and inner lining board.

(2) *LOCK PILLAR REPLACEMENT (fig. 1).* Remove the inner lining board, hardware, glass, and inner belt rail. Remove the screws from the joints, and drive the lock pillar off the assembly, being careful not to damage the lining board, bottom bar, center bar, or belt rail. Clean the tenons, and install the new lock pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws, hardware, glass, inner belt rail, and inner lining board.

(3) *OUTSIDE LINING BOARD REPLACEMENT (fig. 1).* Remove the hardware, glass, inner lining board, and inner belt rail. Remove the lock pillar and screws from the outer lining board, outer belt rail, bottom bar, and center bar.

NOTE: *If the hinge pillar and header bar are damaged or should be replaced for any other reasons, remove them instead of the lock pillar, and proceed as outlined below.*

Place the hinge pillar in a vise equipped with padded jaws, and work the lining board back and forth, at the same time tapping it lightly to break it loose to prevent damage to the hinge pillar. Remove the outside lining board. Clean out the rabbets and grooves. Install the new lining board and the lock pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Remove the blocks and strainers from the old panel, and assemble them to the new panel. Install the screws, hardware, glass, inner belt rail, and inside lining board.

(4) *BELT RAIL OR OUTER BOTTOM BAR REPLACEMENT (fig. 1).* Remove the hardware, glass, inside lining board and inner belt rail. Remove the lock pillar or hinge pillar, being careful not to damage it. Clean all of the joints. Install the new outer belt rail or bottom bar and pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws, hardware, glass, inside lining board, and inner belt rail.

(5) *CENTER BAR REPLACEMENT.* Remove the hardware, inner lining board, glass, and inner belt rail. Remove the screws from the center bar.

NOTE: *Slide a thin board between the lining board and the center bar to protect the lining board from being scratched.*

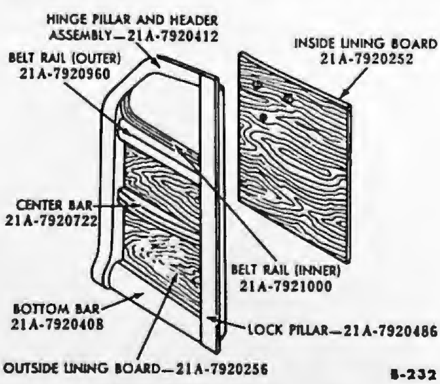

Fig. 1—Front Door Assembly

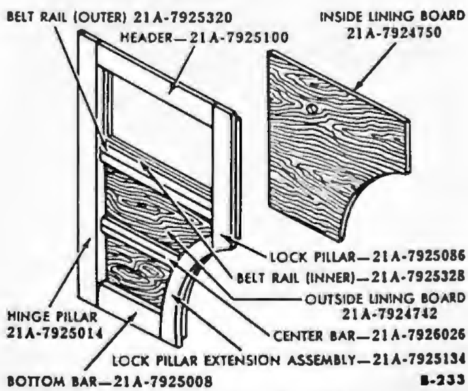

Fig. 2—Rear Door Assembly

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Saw through the center bar and remove it. Clean the joints. Saw the tenon off either end of the new center bar. Install the new center bar, using glue on the remaining joint. Install the screws, glass, inner belt rail, inner lining, and hardware.

b. Rear Door.

The following pars. apply to the repair of either the left hand door or the right hand door.

(1) *HEADER REPLACEMENT (fig. 2).* Remove the side mouldings and glass run. Saw the header off near the lock pillar and the hinge pillar. Remove the screws from the joints. Using a chisel, clean the pillar joints. Install a new header, using glue to secure the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws in the joints. Install the glass run and the side mouldings.

(2) *LOCK PILLAR REPLACEMENT (fig. 2).* Remove the inside lining board, hardware, glass, inside mouldings, and belt rail. Saw the pillar off at each joint, being careful not to cut the outside lining. Remove the screws from the joints. Using a chisel, clean the joints. Install the new pillar, using glue to secure the joints. Install the screws in the joints. Install glass, inner lining, inside belt rail, inside mouldings, and hardware.

(3) *LOCK PILLAR EXTENSION REPLACEMENT (fig. 2).* Remove the inside lining board and hardware. Saw the lock pillar extension off at the joints, being careful not to cut the outside lining board. Remove the screws from the joints. Using a chisel, clean the joints. Install the lock pillar extension and glue the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws in the joints. Install the hardware and the inner lining board.

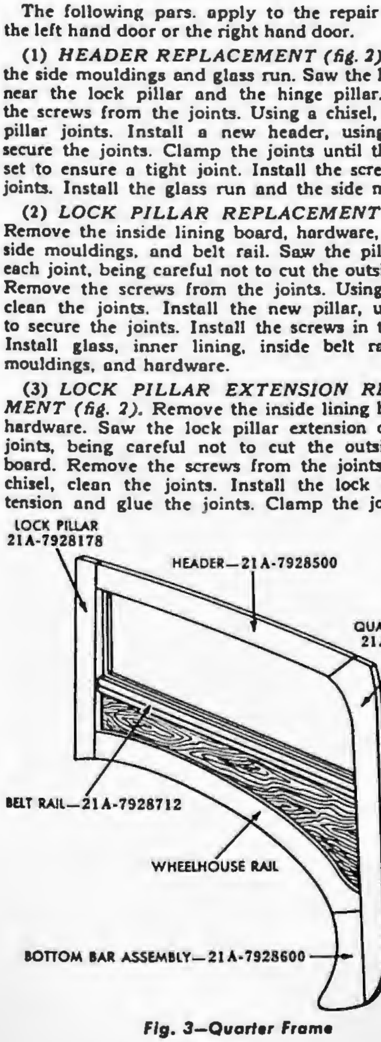

Fig. 3—Quarter Frame

(4) *BOTTOM BAR REPLACEMENT (fig. 2).* Remove the screws and hardware necessary to remove the inner lining board, and remove the board. Remove the lock pillar extension. Saw the bottom bar off near the hinge pillar. Remove the screws from the joints. Using a chisel, clean the joint in the hinge pillar. Install the new lock pillar and bottom bar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the inner lining board, screws, and hardware.

(5) *HINGE PILLAR REPLACEMENT (fig. 2).* Remove the inner lining board, hardware, glass, and inner belt rail inside mouldings. Saw the pillar off the joints, being careful not to cut the outside lining board. Remove the screws from the joints. Using a chisel, clean the joints. Install the new pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the inner belt rail inside moulding, glass, inner lining board, and hardware.

(6) *CENTER BAR REPLACEMENT (fig. 2).* Remove the necessary hardware, and the inside lining board. Remove the screws that hold the center bar to the outside lining board. Knock the center bar off (lock pillar extension end first). Clean the joints. Install the new center bar, using glue on the joints. Install the inside lining board and the hardware.

(7) *OUTER BELT RAIL REPLACEMENT (fig. 2).* Remove the hardware, inside lining board, glass, inside mouldings, and inside belt rail. Remove the lock pillar. Saw the outer belt rail off at the hinge pillar. Using a chisel, clean the joint in the hinge pillar. Install the new belt rail and lock pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws in the joints. Install the glass, inside belt rail, inside lining board, inside mouldings, and hardware.

(8) *OUTSIDE LINING BOARD (fig. 2).* Remove the inside lining board, glass, hardware, inside belt rail, and inside moulding. Remove the hinge pillar. Remove the screws that secure the outside lining board. Place the lock pillar in a vise equipped with padded jaws. Work the outside lining board back and forth, and at the same time tapping to break it loose to prevent damaging the lock pillar and lock pillar extension. Remove the outside lining board. Clean out the grooves and rabbets. Install the new outside lining board and hinge pillar to the lock pillar, using glue on the joints. Install a clamp on the joints to hold them in place until the glue is set. Install the screws, glass, inside belt rail, inside mouldings, inside lining board, and hardware.

c. Quarter Frame.

The following pars. apply to the repair of either the left hand quarter frame or the right hand quarter frame.

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(1) *HEADER REPLACEMENT (fig. 3).* Remove the necessary hardware and the glass from the quarter frame. Saw through the header near the quarter pillar and lock pillar. Remove the screws from the header joints. Using a chisel, clean the joints in the quarter pillar and lock pillar. Install the new header, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws in the header joints. Install the glass and hardware.

(2) *LOCK PILLAR REPLACEMENT (fig. 3).* Remove the glass and necessary hardware. Saw the pillar off close to the header and wheelhouse rail. Remove the screws from the joints and lining board. Remove the lock pillar. Using a chisel, clean the header and wheelhouse rail joints. Install the new lock pillar, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the screws in the joints. Install the glass and hardware.

(3) *BELT RAIL REPLACEMENT (fig. 3).* Remove the glass, necessary hardware, and lining board. Remove the screws from the lock pillar joints and belt rail joint. Remove the lock pillar. Saw the belt rail off near the quarter pillar. Using a chisel, clean the quarter pillar joint. Install a new belt rail and lock pillar, using glue on the joints. Install clamps on the joints until the glue is set to ensure tight joints. Install the screws in the joints. Install the glass, lining board, and hardware.

(4) *QUARTER PILLAR AND REAR BOTTOM BAR ASSEMBLY REPLACEMENT (fig. 3).* Remove the necessary hardware. Remove the lining board and glass. Saw the pillar off approximately 13 inches from the bottom or just below the rear bottom bar assembly. Saw through the pillar at the belt rail joint and header joint.

Remove the screws from the joints. Using a chisel, clean the joints. Install a new quarter pillar and bottom rear bar assembly, using glue on the joints. Clamp the joints until the glue is set to ensure a tight joint. Install the lining board, glass, hardware, and screws.

(5) *WHEELHOUSE RAIL REPLACEMENT (fig. 3).* Remove the necessary hardware. Remove the lining board and glass. Saw through the wheelhouse rail at the quarter pillar, bottom rear bar assembly, and lock pillar. Remove the screws from the joints. Using a chisel, clean the joints. To install the wheelhouse rail, coat the joints with glue, and assemble the wheelhouse rail rear joint to the quarter pillar and bottom bar assembly. Using a bar clamp in the center of the wheelhouse rail to the center of the belt rail, spring the front joint in place. Clamp the joints until the glue is set to ensure a tight joint. Install the screws. Install the glass, lining board, and hardware.

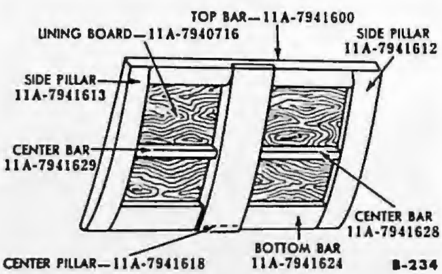

Fig. 4—Tail Gate

d. Tail Gate.

The tail gate wood part numbers are illustrated in fig. 4.

(1) *SIDE PILLAR REPLACEMENT (RIGHT OR LEFT) (fig. 4).* Remove the hardware and lining board. Remove the screws from the pillar joints. Remove the pillar from the top bar, center bar, and bottom bar. Clean the tenons and coat them with glue. Install the new pillar and clamp the joints until the glue is set. Install the screws in the joints. Install the lining board and hardware.

(2) *TOP AND BOTTOM BAR REPLACEMENT (fig. 4).* Remove the hardware and lining board. Remove the screws from one side pillar, and remove the pillar. Saw through the top or bottom bar near the remaining side pillar, and remove the bar. Using a chisel, clean the side pillar joint. Install the new bar, using glue on the joints. Clamp the joints until the glue is set to ensure tight joints. Install the lining board and hardware.

(3) *CENTER BAR REPLACEMENT (fig. 4).* Remove the hardware and lining board. Remove the screws from the joints. Remove the center bar, and clean the joints in the pillars. Install the new center bar, using glue on the joints. Install the screws in the joints. Install the lining board and hardware.

(4) *CENTER PILLAR REPLACEMENT (fig. 4).* Remove the hardware and lining board. Remove the screws from the joints. Saw through the center pillar near the top bar and bottom bar. Remove the center pillar. Using a chisel clean the top and bottom bar joints. Install the new center pillar, using glue on the joints. Install the screws in the joints. Install the lining board and hardware.

January 8, 1948

PREVENTIVE MAINTENANCE AND LUBRICATION

Instructions

a. Preventive Maintenance Compared to Lubrication Only. The various factors that effect the performance and operation of cars and trucks deteriorate or get out of adjustment by a gradual process that is entirely normal. Contrary to common belief, ninety per cent of these changes are **not** avoided or retarded by regular lubrication. Yet many owners believe that if they have regular lubrication they are doing everything possible to maintain their car or truck. This wrong belief can indirectly result in scored brake drums, high fuel consumption, faulty operation, wheel tramp, excessive tire wear, hard starting, and road failures along with other difficulties not avoided by lubrication alone. For these reasons, the emphasis should be placed on "Preventive Maintenance and Lubrication" rather than on "Lubrication" alone.

b. Two Separate Operations. The regular preventive maintenance and lubrication of the various vehicles have been divided into two new separate service operations. Operation MA-1-A, recommended every 1,000 miles, covers certain preventive maintenance inspections and services in addition to lubrication. Operation MA-1-B, recommended every 5,000 miles, includes inspection of the brake lining, a brake adjustment, a complete engine tune-up, and many other operations and inspections in addition to a complete lubrication.

c. Selling Preventive Maintenance. These operations agree in scope with the "Inspection, Preventive Maintenance, and Lubrication" procedures outlined in the 1945 Operator's Manuals. They are not intended to compete with a mere lubrication, but are designed to eventually replace it. Obviously, if owners insist on lubrication only, they should be able to secure it. However, never miss an opportunity to point out to them that the preventive maintenance services are more economical in the long run and that normal wear will be compensated for by the necessary adjustments before this wear can effect the performance or result in permanent damage. Operation MA-1-B may be sold to owners who are experiencing trouble as a result of lack of proper maintenance. This operation will re-establish the adjustments, etc., and in most cases will correct the trouble. The "Engine Tune-up", operation P-100-E, and the "Test Set Test", operation P-100-C, as separate operations, can now be discontinued. These operations can be replaced by operation MA-1-B and by the various symptom procedures in the Trouble Shooting Service Bulletins.

d. Extra Operations. The various inspections in both operation MA-1-A and MA-1-B will often uncover the need for other services. Throughout these procedures, extra operations are in *Italics*, and are followed by the word "*extra*".

e. Procedures. After reading the new Operator's Manuals, many owners no doubt will want these services and since these particular combinations of services are new, the sequence of operations for each vehicle type is given. Perform all of the operations checked under the vehicle name. In order to perform these operations in the least possible time follow and learn the sequence of the operations as presented here, and have the necessary equipment and tools conveniently located.

f. Oil Change. Throughout the following procedures it will be noted that the instructions vary where an oil change is due. Oil should be changed as follows:

(1) **New Vehicle or After Engine Overhaul.** After the new or overhauled engine has been operated 300 miles, the oil should be changed.

(2) **Subsequent Oil Changes.** Oil should be changed every 2000 miles or not less than four times each year or at any time when the oil becomes excessively diluted or polluted. It is advisable to use the accumulated mileage indicated on the speedometer as a guide for oil changes.

Regular inspections, preventive maintenance and lubrication service, prevents the falling off of performance, avoids troubles, prevents premature wear, assures efficiency and lengthens the safe useful life of the vehicle.

OPR. MA-1-A
1000-Mile Inspection, Preventive Maintenance and Lubrication

	OPERATIONS UNDER VEHICLE	Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
1	Wipe all lubrication fittings and filler plugs to remove oil, grease, dirt, etc.	✓	✓	✓	✓	✓	✓
2	If engine oil change is due, remove the oil pan drain plug and allow the engine oil to drain.	✓	✓	✓	✓	✓	✓
3	On vehicles equipped with separate spindle arms tighten the arms. Grasp the front of the front wheels and push them away from each other and then pull them toward each other at the same time observing the tie rod and drag link ends for excessive wear (*correction extra*).	✓	✓	✓	✓	✓	✓
4	Lubricate the tie rod and drag link ends with recommended lubricant.	✓	✓	✓	✓	✓	✓
5	Grasp the front wheels at the top and bottom and shake them, observing the movement of the brake plates. If the brake plates have more than 1/32 inch movement, *rebush the spindles* (*extra*).	✓	✓	✓	✓	✓	✓
6	Lubricate the spindle pins with recommended lubricant.	✓	✓	✓	✓	✓	✓
7	Shake the front wheels and observe the pitman arm for looseness and tighten if required.	✓	✓	✓	✓	✓	✓
8	Grasp the wheel and push in and then pull out. If any free play is noticed, the wheel bearing needs adjusting (*correction extra*).	✓	✓	✓	✓	✓	✓
9	Tighten the universal joint U-bolts.				✓	✓	✓
10	Lubricate the universal joint with recommended lubricant.	✓	✓	✓	✓	✓	✓
11	Lubricate the propeller shaft support bearing with recommended lubricant.	✓	✓	✓	✓	✓	
12	Lubricate the clutch release shaft, equalizer shaft, brake and clutch pedal with recommended lubricant.	✓	✓	✓	✓	✓	✓
13	Inspect the springs and *replace sagging springs, broken leaves or broken tie bolt* (*extra*).	✓	✓	✓	✓	✓	✓
14	Lubricate springs with recommended lubricant.	✓	✓	✓	✓	✓	✓
15	Lubricate the spring shackle bolts with recommended lubricant.				✓	✓	✓
16	Remove the filler plug from the transmission and rear axle, fill to proper level with recommended lubricant.	✓	✓	✓	✓	✓	✓

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OPERATIONS UNDER VEHICLE (Cont'd)

		Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
17	Examine the exhaust pipe, muffler and tail pipe for corrosion and leakage (*correction extra*).	✓	✓	✓	✓	✓	✓
18	Tighten exhaust pipe, muffler brackets and clamps.	✓	✓	✓	✓	✓	✓
19	Tighten the rear axle housing bolts and inspect the rear axle for leakage (*corrections extra*).	✓	✓	✓	✓	✓	✓
20	Examine the transmission for leakage (a very slight seepage of oil should not be considered abnormal (*correction extra*).	✓	✓	✓	✓	✓	✓
21	If the engine oil has been drained, install the drain plug.	✓	✓	✓	✓	✓	✓
22	Inflate the tires to recommended pressure. Examine the tires for cuts, radial cracks, blisters or unusual wear.	✓	✓	✓	✓	✓	✓

OPERATIONS UNDER HOOD

		Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
23	If the engine oil has been drained, refill the oil pan to proper level with recommended grade of oil.	✓	✓	✓	✓	✓	✓
24	Oil the water pumps.			✓			
25	Oil the distributor.	✓	✓	✓	✓	✓	✓
26	Oil the throttle control linkage.	✓	✓	✓	✓	✓	✓
27	Oil the generator bearing.	✓	✓	✓	✓	✓	✓
28	Remove the steering gear housing filler plug and fill the steering gear housing with recommended lubricant. Install plug.	✓	✓	✓	✓	✓	✓
29	Check the state of charge of the battery and replenish the water. *Recharge the battery if required (extra).*	✓	✓	✓	✓	✓	✓
30	Remove and clean the battery terminal connections and terminals and coat them lightly with grease. Install the terminal connections and tighten them securely.	✓	✓	✓	✓	✓	✓
31	Tighten the battery hold-down frame.	✓	✓	✓	✓	✓	✓
32	Remove the air cleaner from the carburetor and clean the element. If the vehicle is equipped with an oil bath type air cleaner, clean the oil reservoir and fill it to the level mark with specified oil. Install the air cleaner.	✓	✓	✓	✓	✓	✓
33	Clean the crankcase breather cap.	✓	✓	✓	✓	✓	✓
34	Examine the fan belt, generator belt, and adjust them if required.	✓	✓	✓	✓	✓	✓
35	Wipe the dirt and grease from the spark plug porcelains.	✓	✓	✓	✓	✓	✓
36	Tighten the fuel line connections at the carburetor, fuel pump, and flexible line.	✓	✓	✓	✓	✓	✓

OPERATIONS UNDER HOOD (Cont'd)		Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
37	Tighten the wire connections at the generator, coil, generator regulator, starting motor, starting motor relay, ignition resistance unit, and ignition switch.	✓	✓	✓	✓	✓	✓
38	Check the condition of the antifreeze or radiator coolant. If signs of excessive rust are apparent, *drain and flush the cooling system* (*extra*).	✓	✓	✓	✓	✓	✓
39	Remove dirt, insects, etc., from the exterior of the radiator core.	✓	✓	✓	✓	✓	✓
40	Tighten all hose connections, including heater hose.	✓	✓	✓	✓	✓	✓
41	Start the engine and warm up to normal operating temperature.	✓	✓	✓	✓	✓	✓
42	Check the operation of the windshield wipers.	✓	✓	✓	✓	✓	✓
43	Check the operation of the headlights, taillights, stop lights, interior lights, and headlight beam control switch.	✓	✓	✓	✓	✓	✓
44	Check the clutch pedal free travel.	✓	✓	✓	✓	✓	✓
45	Check the pedal reserve of the service brake pedal.	✓	✓	✓	✓	✓	✓
46	Check the hand brake lever reserve.	✓	✓	✓	✓	✓	✓
47	Adjust the carburetor idle speed adjustment so the idling speed of the engine is approximately 500 revolutions per minute. If required, manipulate the idle fuel adjustment ½ to 1¼ turns open until the engine idles smoothly.	✓	✓	✓	✓	✓	✓
48	Oil the door hinges (dripless penetrating oil).	✓	✓	✓	✓	✓	✓
49	Lubricate the dovetail and striker plate with lubricant impregnated wax.	✓	✓	✓	✓	✓	✓

OPR. MA-1-B

5000-Mile Inspection, Preventive Maintenance and Lubrication

OPERATIONS UNDER VEHICLE		Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
1	Before getting under the vehicle make sure the hand brake lever is fully released.	✓	✓	✓	✓	✓	✓
2	Wipe all lubrication fittings, filler plugs (including shock absorber filler plugs) to remove all grease, dirt, etc. Remove the drain plugs from the transmission and rear axle, allow them to drain.	✓	✓	✓	✓	✓	✓
3	If an engine oil change is due, remove the oil pan drain plug and allow the engine oil to drain.	✓	✓	✓	✓	✓	✓
4	Grasp the front of the front wheels and push them away from each other and then pull them toward each other at the same time observing the tie rod and drag link ends for excessive wear (*correction extra*). On trucks, tighten the steering arm to the spindle if any looseness is noted.	✓	✓	✓	✓	✓	✓

OPERATIONS UNDER VEHICLE (Cont'd)		Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
5	Lubricate the tie rod and drag link ends with recommended lubricant.	✓	✓	✓	✓	✓	✓
6	Grasp the front wheels at the top and bottom and shake them, observing the movement of the brake plates. If the brake plates have more than 1/32-inch movement, *rebush the spindles* (*extra*).	✓	✓	✓	✓	✓	✓
7	Lubricate the spindle pins with recommended lubricant.	✓	✓	✓	✓	✓	✓
8	Shake the front wheels and observe the Pitman arm for looseness and tighten if required.	✓	✓	✓	✓	✓	✓
9	Tighten the steering gear housing mounting bolts if necessary.	✓	✓	✓	✓	✓	✓
10	Lubricate the clutch release shaft, equalizer shaft, clutch and brake pedal with recommended lubricant.	✓	✓	✓	✓	✓	✓
11	Shake the propeller shaft and observe the universal joint for side play or end play. If any play is noticeable, *repair or replace the universal joint* (*extra*).				✓	✓	✓
12	Tighten the universal joint U-bolts.				✓	✓	✓
13	Lubricate the universal joints with recommended lubricant.	✓	✓	✓	✓	✓	✓
14	Lubricate the propeller shaft support bearing with recommended lubricant.	✓	✓	✓	✓	✓	
15	Inspect the springs for broken leaves, broken tie-bolts, or sagging springs. *Repair or replace springs if required* (*extra*).	✓	✓	✓	✓	✓	✓
16	Tighten the front and rear spring U-bolts and spring clip nuts.	✓	✓	✓	✓	✓	✓
17	Lubricate the springs with recommended lubricant.	✓	✓	✓	✓	✓	✓
18	Lubricate the spring shackles with recommended lubricant.				✓	✓	✓
19	On vehicles equipped with a vacuum controlled two-speed axle, check the vacuum hose for leakage and tighten all connections. *Replace with new parts where necessary* (*extra*).	✓	✓	✓	✓	✓	
20	Tighten the exhaust pipe, muffler brackets and clamps. *Replace parts where necessary* (*extra*).	✓	✓	✓	✓	✓	✓
21	Examine the exhaust manifolds for cracks or leakage. *Repair or replace parts if necessary* (*extra*).	✓	✓	✓	✓	✓	✓
22	Tighten all exhaust manifold nuts and cap screws.	✓	✓	✓	✓	✓	✓
23	Replenish the fluid in the shock absorbers.	✓	✓	✓			✓
24	Rock the vehicle and observe the shock absorbers for leakage. *Replace leaking shock absorbers* (*extra*).	✓	✓	✓			✓
25	Shake the shock absorber links, if any free play is noticeable, *replace the links* (*extra*).	✓	✓	✓			✓

OPERATIONS UNDER VEHICLE (Cont'd)

No.	Operation	Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
26	Shake the rear of the front radius rod and observe the ball joint for looseness. *Replace the front radius rod ball joint rubber bushing if required (extra).*	✓	✓	✓			
27	Install the drain plugs in the oil pan, transmission and rear axle. Fill the transmission and rear axle to correct level with recommended lubricant.	✓	✓	✓	✓	✓	✓
28	Tighten the rear axle housing bolts.	✓	✓	✓	✓	✓	✓
29	Inspect rear axle for lubricant leakage. *Make the necessary repairs (extra).*	✓	✓	✓	✓	✓	✓
30	Examine the transmission for leakage. (A very slight seepage of oil should not be considered abnormal).	✓	✓	✓	✓	✓	✓
31	Tighten the fuel tank hold-down bolts and fuel line connection at the fuel tank.	✓	✓	✓	✓	✓	✓
32	Drain a quantity of fuel from the tank to remove any accumulation of water or sediment in the tank.				✓	✓	
33	Tighten the engine oil pan cap screws and examine the oil pan for leakage (*correction other than tightening extra*).	✓	✓	✓	✓	✓	✓
34	Tighten the starting motor mounting bolts and cable connections.	✓	✓	✓	✓	✓	✓
35	Check the steering gear sector shaft end play and adjust it if required.	✓	✓	✓	✓	✓	✓
36	Remove all four wheel and hub assemblies.	✓	✓	✓	✓	✓	✓
37	Check the condition of the brake lining. *Replace the brake lining if it is worn to within 1/32 inch of the rivet heads or if the lining is grease soaked (extra).*	✓	✓	✓	✓	✓	✓
38	Inspect all wheel slave cylinders for leakage. *Repair or replace leaking wheel slave cylinders (extra).*	✓	✓	✓	✓	✓	✓
39	Remove the wheel bearings. Clean and pack the wheel bearings with recommended lubricant. Install wheel bearings, using new grease retainers if required.	✓	✓	✓	✓	✓	✓
40	Install the wheel and hub assemblies and adjust the wheel bearings.	✓	✓	✓	✓	✓	✓
41	Adjust the service brakes (shoe adjustment).	✓	✓	✓	✓	✓	✓
42	Tighten all wheel nuts.	✓	✓	✓	✓	✓	✓
43	Inflate tires to recommended pressure. Examine the tires for cuts, radial cracks, blisters or unusual wear. *Repair or replace if required (extra).*	✓	✓	✓	✓	✓	✓
44	Rotate one front wheel, when it comes to stop, mark the tire at the bottom. Repeat this several times. If the wheel stops at the same place each time, the wheel is out of balance. Repeat this procedure for the other front wheel. *Make the necessary corrections (extra).*	✓	✓	✓			

OPERATIONS UNDER VEHICLE (Cont'd)		Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
45	While holding the service brake pedal down to hold the brake shoes against the drum, adjust all of the slack out of the hand brake cable.	✓	✓	✓			✓
46	Lubricate the hand brake cable equalizer with pressure gun lubricant.	✓	✓	✓			✓
47	On trucks, inspect the hand brake. If the drum is scored or the lining is excessively worn, *repair or replace if required* (*extra*).				✓	✓	
48	If the clearance between the hand brake lining and the drum is in excess of 0.020 inch, adjust the hand brake.				✓	✓	
OPERATIONS UNDER HOOD							
49	Oil the water pumps.			✓			
50	Oil the fan.	✓	✓	✓	✓	✓	✓
51	Oil the throttle controls.	✓	✓	✓	✓	✓	✓
52	Oil the generator bearings.	✓	✓	✓	✓	✓	✓
53	Remove the steering gear housing filler plug and fill the steering gear housing with specified lubricant and reinstall the plug.	✓	✓	✓	✓	✓	✓
54	Check the state of charge of the battery and replenish the water. *Recharge the battery if required* (*extra*).	✓	✓	✓	✓	✓	✓
55	Remove and clean the battery terminal connections and terminals and coat them lightly with grease. Install the terminal connections and tighten them securely. Replace cables or ground strap if required.	✓	✓	✓	✓	✓	✓
56	*Repair or replace the battery hold-down frame and box if required* (*extra*).	✓	✓	✓	✓	✓	✓
57	Tighten the battery hold-down frame if required.	✓	✓	✓	✓	✓	✓
58	Install a new oil filter cartridge.	✓	✓	✓	✓	✓	✓
59	If the engine oil has been drained, refill oil pan to proper level with recommended grade of oil.	✓	✓	✓	✓	✓	✓
60	Remove all spark plugs and clean them with a sand blast cleaner. Set the gaps at 0.025 inch. Replace any plugs that have broken or chipped porcelain or burned electrodes.	✓	✓	✓	✓	✓	✓
61	Test the compression of each cylinder. Cylinders with the compression below normal indicate valves or rings are leaking (*correction extra*). Higher than normal compression indicates an excessive accumulation of carbon (*correction extra*).	✓	✓	✓	✓	✓	✓
62	Install the spark plugs.	✓	✓	✓	✓	✓	✓
63	Tighten all cylinder head nuts.	✓	✓	✓	✓	✓	✓
64	Tighten the intake manifold nuts and cap screws.	✓	✓	✓	✓	✓	✓
65	Remove the fuel pump cover and clean the sediment chamber. Install the fuel pump cover using a new gasket.	✓	✓	✓	✓	✓	✓

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OPERATIONS UNDER HOOD (Cont'd)

No.	Operation	Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
66	Remove and clean the distributor, examine the points (replace burned or pitted points), adjust the point gap, reset the timing and lubricate the distributor. Install the distributor.	✓	✓	✓	✓	✓	✓
67	*Replace the distributor caps and/or terminal plates if they have cracks, carbon tracks, or are otherwise damaged.*	✓	✓	✓	✓	✓	✓
68	Clean the carburetor air cleaner element. If the vehicle is equipped with an oil bath type cleaner, clean the oil reservoir and fill it to the level mark with the specified oil.	✓	✓	✓	✓	✓	✓
69	Clean the crankcase breather cap.	✓	✓	✓	✓	✓	✓
70	Replace the fan and generator belts if they are cracked or badly worn. Adjust all belts.	✓	✓	✓	✓	✓	✓
71	Check the generator pulley for looseness and tighten it if required.	✓	✓	✓	✓	✓	✓
72	Check the condition of all hose and tighten the connections (including heater hose). *Replace any hose that shows signs of deterioration (extra).*	✓	✓	✓	✓	✓	✓
73	Tighten the radiator mounting bolts.	✓	✓	✓	✓	✓	✓
74	Check the condition of the antifreeze or radiator coolant, if signs of excessive rust are apparent, *drain, clean, and flush the cooling system (extra).*	✓	✓	✓	✓	✓	✓
75	Remove dirt, insects, etc., from the exterior of the radiator core.	✓	✓	✓	✓	✓	✓
76	Tighten the wire connections at the generator, generator regulator, coil and the starting motor relay.	✓	✓	✓	✓	✓	✓

DRIVER'S COMPARTMENT OPERATIONS

No.	Operation	Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
77	Tighten the wire connections at the circuit breaker, ignition resistance unit and the ignition switch.	✓	✓	✓	✓	✓	✓
78	Apply the service brake and check the hand brake lever free travel. If the hand brake lever free travel is more than ½ inch, readjust the hand brake more carefully.	✓	✓	✓			✓
79	Check for and free up any binding o. the choke, throttle, and accelerator controls.	✓	✓	✓	✓	✓	✓
80	*If the accelerating pump is binding, disassemble the carburetor and repair (extra).*	✓	✓	✓	✓	✓	✓
81	Check the condition and operation of the headlights, taillights, stop light, panel lights and interior lights. Replace any burned out bulbs.	✓	✓	✓	✓	✓	✓
82	Check the operation of the headlight beam control switch.	✓	✓	✓	✓	✓	✓
83	Aline headlights.	✓	✓	✓	✓	✓	✓
84	Adjust the clutch pedal free travel.	✓	✓		✓	✓	✓
85	On Lincoln check the clutch pedal free travel (*correction extra*).			✓			
86	Replenish the hydraulic brake fluid.	✓	✓	✓	✓	✓	✓

	DRIVERS COMPARTMENT OPERATIONS (Cont'd)	Ford	Mer-cury	Lin-coln	C.O.E.	Truck	Com-mercial Car
87	Check the service brake pedal reserve. If the brake pedal is spongy, *bleed the brakes, (extra).* If the brake pedal reserve is less than ½ of the total pedal travel, readjust the brake shoes more carefully.	✓	✓	✓	✓	✓	✓
88	Start the engine and warm it to normal operating temperature.	✓	✓	✓	✓	✓	✓
89	Check the windshield wiper blades and the operation of the windshield wipers. *Repair or replace if required (extra).*	✓	✓	✓	✓	✓	✓

FINAL OPERATIONS

		Ford	Mercury	Lincoln	C.O.E.	Truck	Commercial Car
90	Adjust the carburetor idle speed to approximately 500 revolutions per minute. Adjust the idle fuel adjustment. Adjust the accelerating pump stroke to suit the approaching season.	✓	✓	✓	✓	✓	✓
91	Disconnect the fuel pump inlet line and connect a vacuum gage to the fuel pump. Start the engine and run at idle speed. *If the vacuum is below 10 inches, repair or replace the pump (extra).* Reconnect the fuel line, using a new flexible line if required.	✓	✓	✓	✓	✓	✓
92	Disconnect the fuel pump outlet line and connect a pressure gage to the fuel pump outlet.Start the engine and run it at idle speed. Normal pressure is from 1.5 to 3.5 pounds. *If correct reading is not obtained, repair or replace the fuel pump (extra).* Reconnect the fuel line.	✓	✓	✓	✓	✓	✓
93	Test the action of the generator regulator and adjust or replace it if required.	✓	✓	✓	✓	✓	✓
94	Test the length of the spark from each spark plug wire. Spark should jump a ¼ inch gap, *if not, make necessary corrections (extra).*	✓	✓	✓	✓	✓	✓
95	Check the front wheel toe-in adjustment and adjust if required.	✓	✓	✓	✓	✓	✓
96	Oil the door hinges (dripless penetrating oil).	✓	✓	✓	✓	✓	✓
97	Check doors for alinement and adjust the striker plates, and dovetails. Lubricate with lubricant impregnated wax.	✓	✓	✓	✓	✓	✓
98	*Replace missing weather strips or rubber bumpers on the doors, hood, and cowl ventilator (extra).*	✓	✓	✓	✓	✓	✓
99	*Check the operation of all window lifts, and repair or replace if required (extra).*	✓	✓	✓	✓	✓	✓
100	Clean the drain holes at the bottom of the doors.	✓	✓	✓	✓	✓	✓
101	*Inspect all exterior surfaces for rust and corrosion, and repair as required (extra).*	✓	✓	✓	✓	✓	✓
102	Convertible cars. Tighten the top bow cap screws and nuts. Check the operation of the top mechanism.	✓	✓	✓			
103	Road test the vehicle.	✓	✓	✓	✓	✓	✓

Lincoln SERVICE CHART Lincoln

LUBRICATION AND MAINTENANCE · 1941 CARS

EACH 1000 MILES (Except F)

A PRESSURE GUN LUBRICANT

B Add GEAR OIL to level of filler plug. Summer S.A.E. 90; Winter S.A.E. 80

C ENGINE OIL (Distributor shaft, generator, brake clevis pins, water pumps and accelerator

D ADD MILD E. P. GEAR OIL to filler plug; S.A.E. 90—all seasons

E ADD HYPOID TYPE GEAR OIL S A E 90 E. P. for summer and winter, except for temperatures below −10°F use HYPOID S.A.E. 80 E. P.

F EVERY 5000 MILES Drain, Flush and Refill with 5 QUARTS ENGINE OIL Recommended Oil
Temp. above 32°F S A E 30
Temp. above 10°F. S A E 20 or 20W Temp. above −10 F 10W;
Lower temperatures 10W plus 10% Kerosene

G Drain SEDIMENT

H Add DISTILLED WATER

J UNIVERSAL JOINT LUBRICANT (Cylinder oil soda soap grease)

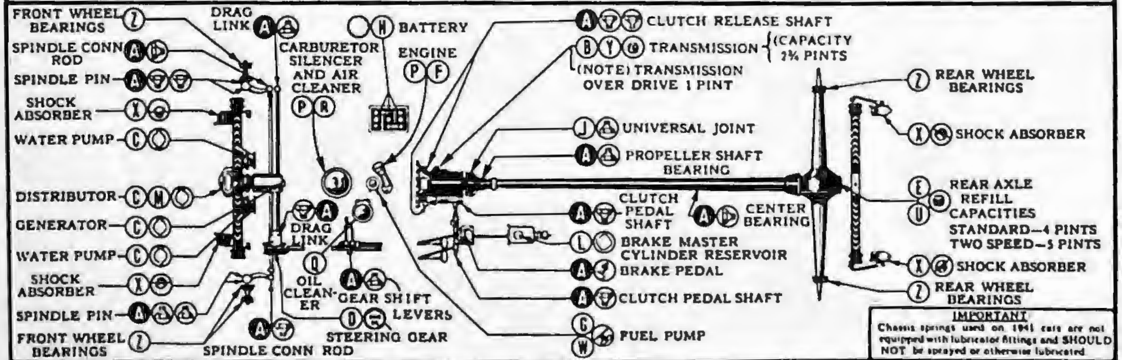
L ADD M 3833 BRAKE FLUID to fill master cylinder reservoir.

M FORD DISTRIBUTOR LUBRICANT M-4601 on Cam Lobes.

N LUBRICANT IMPREGNATED WAX on dovetails, door striker plates and hood lacings.

O PENETRATING DRIPLESS TYPE LUBRICANT for door hinges.

P WASH SCREEN IN GASOLINE—wet with engine oil when dry.



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

Q REPLACE FILTER CARTRIDGE every 10,000 Miles.

R If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in F

U Drain, flush and refill with HYPOID TYPE GEAR OIL S A E 90 E P for summer and winter, except for temperature below −10°F then use HYPOID TYPE GEAR OIL S A E 80 E P

W Remove and clean SCREEN

X ADD FORD SHOCK ABSORBER FLUID to level of filler plug

Y Drain, flush and refill with GEAR OIL Winter-S A E 80 Summer—S A E 90

Z Clean and repack with FORD WHEEL BEARING LUBRICANT M 4644 if required.

CAPACITIES

Engine oil pan	5 qts.	2 speed rear axle	5 pts.	Tire pressure	26 lbs.
Transmission	2.75 pts.	Cooling system	27 qts.	Clutch pedal, free travel	1½ to 2 in.
Rear axle	4 pts.	Fuel tank	19.5 gals.	Brake pedal, free travel	¼ to ½ in.

LINCOLN AND LINCOLN-ZEPHYR LUBRICATION AND MAINTENANCE CHART, 1941
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1941 MERCURY, SUPER DELUXE FORD, DELUXE FORD AND FORD COMMERCIAL

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins, Fan and Accelerator)

(D) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug
Winter S.A.E. 80
Summer S.A.E. 90

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug Summer S.A.E. 140
Winter S.A.E. 90; (Below Zero) S.A.E. 80
(In Steering Gear use S.A.E. 90 for All Seasons)

(F) Drain, Flush and Refill with 5 QUARTS ENGINE OIL EVERY 1000 MILES. Recommended Oil
Temperature above 32°F – S.A.E. 30
Temperature above 10°F – S.A.E. 20 or 20W
Temperature above – 10°F – 10W.
Lower Temperatures – 10W plus 10% Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(J) UNIVERSAL JOINT LUBRICANT (Cylinder Oil Soda Soap Grease)

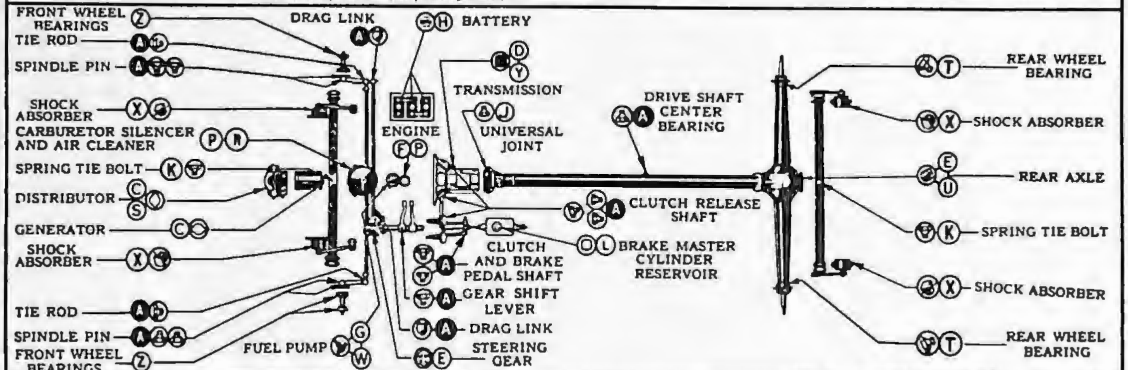
(K) FORD SPRING LUBRICANT M 4638

(L) ADD FORD BRAKE FLUID M 3833 – Correct Level ¼" from Top

(N) LUBRICANT IMPREGNATED WAX On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen In Gasoline – Wet with Engine Oil When Dry



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(R) If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in (F)

(S) Ford Distributor LUBRICANT M 4601 On Cam Lobes

(T) FORD WHEEL BEARING LUBRICANT M 4664 Use hand gun sparingly

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL:
Winter S.A.E. 90
Summer S.A.E. 140

(W) Remove and Clean Screen

(X) ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug

(Y) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL
Winter S.A.E. 80
Summer S.A.E. 90

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

CAPACITIES

Engine oil pan, V-8	5 qts.	Brake pedal, free travel	¼ to ½ in.	Fuel tank, commercial	15 gals.
Engine oil pan, 4 cyl.	4 qts.	Cooling system, passenger car	25½ qts.	Tire pressure, Mercury	24 lbs.
Transmission	2.75 pts.	Cooling system, V-8 commercial	22 qts.	Tire pressure, Ford passenger car	28 lbs.
Regular truck or bus transmission	5 pts.	Cooling system, 4 cyl. commercial	14 qts.	Tire pressure, commercial	30 lbs.
Clutch pedal, free travel	1 to 1¼ in.	Fuel tank, passenger car	17 gals.		

MERCURY, SUPER DELUXE FORD, DELUXE FORD AND FORD COMMERCIAL LUBRICATION AND MAINTENANCE CHART, 1941
Fig. 2

LUBRICATION AND MAINTENANCE CHART
1941 FORD 6 CYLINDER PASSENGER CAR

EACH 1000 MILES

A — PRESSURE GUN LUBRICANT

C — ENGINE OIL Generator, Accelerator, and Water Pump

D — ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug · Winter S.A.E. 80 Summer S.A.E. 90

E — ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug. Summer S.A.E. 140. Winter S.A.E. 90; (Below Zero) S.A.E. 80 (In Steering Gear use S.A.E. 90 for All Seasons)

F — Drain, Flush and Refill with 5 QUARTS ENGINE OIL EVERY 2000 MILES. Recommended Oil. Temperature above 32°F — S.A.E. 30; Temperature above 10°F. — S.A.E. 20 or 20W; Temperature above —10°F — 10W. Lower Temperatures — 10W plus 10% Kerosene.

G — Drain Sediment

H — Add Distilled Water

J — UNIVERSAL JOINT LUBRICANT (Cylinder Oil Soda Soap Grease)

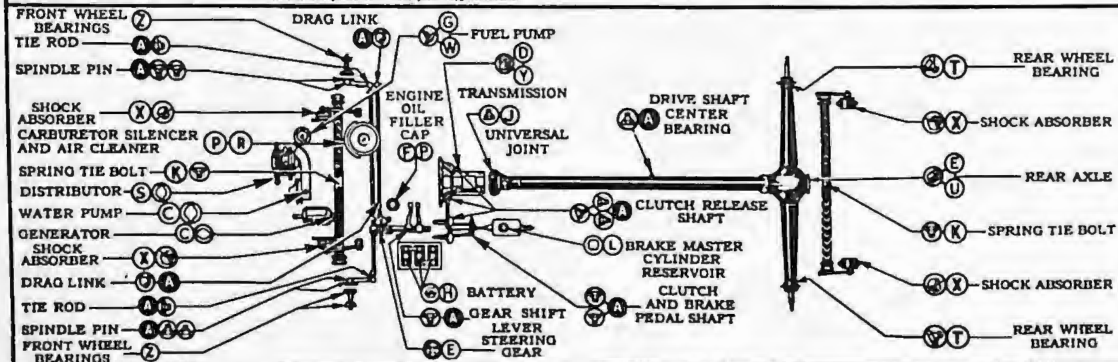
K — FORD SPRING LUBRICANT M-4628

L — ADD FORD BRAKE FLUID M-3833 — Correct Level ½" from Top

N — LUBRICANT IMPREGNATED WAX On Hood Lacings Door Striker Plates and Dovetails

O — PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

P — Wash Screen In Gasoline — Wet with Engine Oil When Dry



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

R — If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in F

S — Ford Distributor LUBRICANT M-4601 On Cam Lobes

T — FORD WHEEL BEARING LUBRICANT M-4664 Use hand gun sparingly

U — Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL: Winter S.A.E. 90 Summer S.A.E. 140

W — Remove and Clean Screen

X — ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug.

Y — Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Winter S.A.E. 80 Summer S.A.E. 90

Z — Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

CAPACITIES

Engine oil pan	5 qts.	Fuel tank	17 gals.
Transmission	2¾ pts.	Tire pressure	28 lbs.
Rear Axle	2½ pts.	Brake pedal, free travel	¼ to ½ in.
Cooling system	17 qts.	Clutch pedal, free travel	1 to 1¼ in.

Ford 6 Cylinder Lubrication and Maintenance Chart, 1941
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1941 FORD REGULAR TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug
Winter S A E 90
Summer S A E 140

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug: Winter S.A.E. 90 Summer S.A.E. 140. (In Steering Gear use S.A.E. 90 for All Seasons)

(F) Every 2000 Miles Drain and Refill with ENGINE OIL.
Atmospheric Temperature

Average Above 90° F.	S.A.E. 40
Minimum Above 32° F.	S.A.E. 30
Minimum Above 10° F.	S.A.E. 20 or 20W
Minimum Above—10° F.	S.A.E. 10 or 10W

Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(K) GEAR OIL: S.A.E. 140

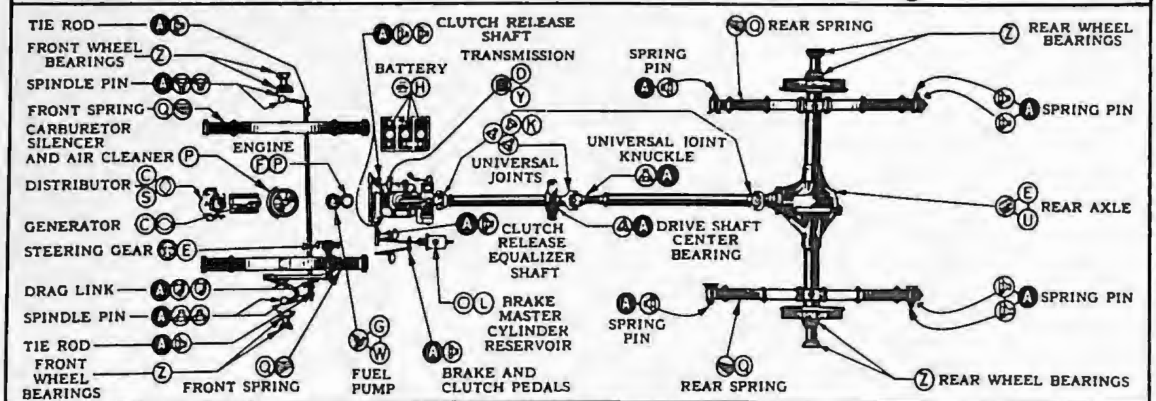
(L) ADD FORD BRAKE FLUID M 3833 —Correct Level ¼" from Top

(N) LUBRICANT IMPREGNATED WAX On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen In Gasoline—Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

(Y) Drain, Flush and Refill with GEAR OIL
Winter S A E. 90
Summer S A E. 140

(W) Remove and Clean Screen

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL
Winter S.A E. 90
Summer S.A B 140

(S) Ford Distributor LUBRICANT M-4601 On Cam Lobes

CAPACITIES

Engine oil pan	5 qts.	Brake pedal, free travel	¼ to ½ in.	Tire pressure varies with tire size, see specifications.	
Transmission	5 pts.	Cooling system	23 qts.	Clutch pedal, free travel	1½ to 1¾ in.
Rear axle	7 pts.	Fuel tank	18 gals.		

REGULAR TRUCK LUBRICATION AND MAINTENANCE CHART, 1941
Fig. 2

LUBRICATION AND MAINTENANCE CHART
1941 FORD ¾ TON AND TONNER TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug: Summer S A E 140
Winter S A E. 90
Winter (Below Zero) S. A. E. 80

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug: Summer S A E. 140.
Winter S.A E 90 (Below Zero) S A E 80
(In Steering Gear use S A E 90 for All Seasons)

(F) Every 2000 Miles Drain and Refill with ENGINE OIL
Atmospheric Temperature

Average Above 90° F	S.A.E. 40
Minimum Above 32° F	S A E 30
Minimum Above 10° F	S.A E. 20 or 20W
Minimum Above −10° F	S A E. 10 or 10W

Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(J) GEAR OIL S.A.E. 140

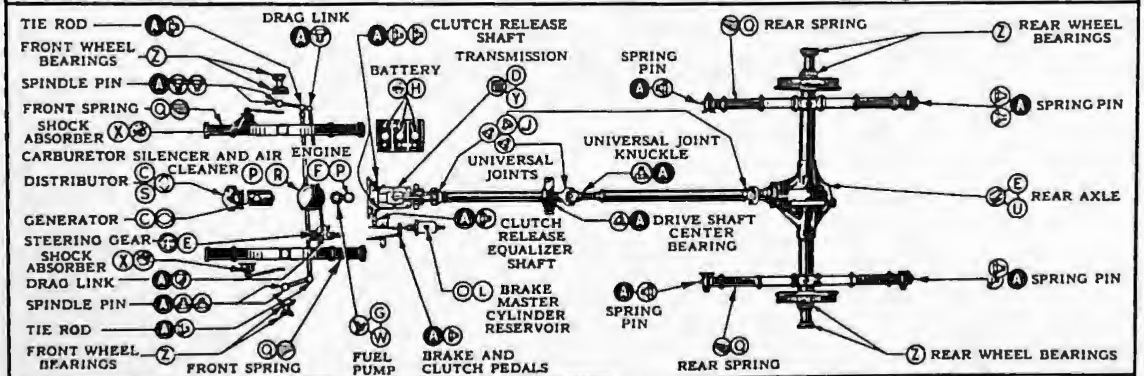
(L) ADD FORD BRAKE FLUID M 3833 — Correct Level ¼" from Top

(N) LUBRICANT IMPREGNATED WAX On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen In Gasoline — Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(R) If equipped with OIL BATH Air Cleaner clean thoroughly, replacing oil with same grade as recommended in (F)

(S) Ford Distributor LUBRICANT M 1601 On Cam Lobes

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL. Summer S A E 140
Winter S A E 90
Winter (Below Zero) S A E. 80

(W) Remove and Clean Screen

(X) ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug

(Y) Drain, Flush and Refill with GEAR OIL Winter S A E. 90 (Below Zero) S A E 80 Summer S A E 140

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4604 if Required

CAPACITIES

V-8 engine oil pan	5 qts.	Rear axle	3 pts.	Fuel tank	18 gals.
4 cyl. engine oil pan	4 qts.	Clutch pedal, free travel	1½ to 1¾ in.	Tire pressure varies with tire size, see specifications	
Transmission	2.75 pts.	Cooling system, V-8	23 qts.	Brake pedal, free travel	¼ to ½ in.
Regular truck or bus transmission	5 pts.	Cooling system, 4 cyl.	14 qts.		

FORD ¾ TON AND TONNER LUBRICATION AND MAINTENANCE CHART, 1941
Fig. 1

LUBRICATION AND MAINTENANCE CHART

1941 FORD CAB-OVER-ENGINE TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug:
Winter S.A.E. 90
Summer S.A.E. 140

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug: Winter S.A.E. 90 Summer S.A.E. 140. (In Steering Gear use S.A.E. 90 for All Seasons)

(F) Every 3000 Miles Drain and Refill with ENGINE OIL::

Atmospheric Temperature	
Average Above 90° F.	S.A.E. 40
Minimum Above 32° F.	S.A.E. 30
Minimum Above 10° F.	S.A.E. 20 or 20W
Minimum Above—10° F.	S.A.E. 10 or 10W

Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(K) GEAR OIL S.A.E. 140

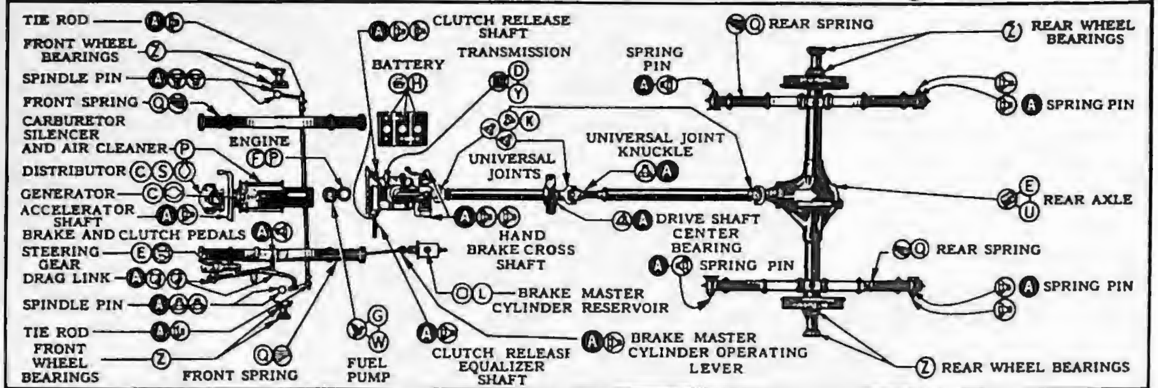
(L) ADD FORD BRAKE FLUID M-3833 —Correct Level ½" from Top

(N) LUBRICANT IMPREGNATED WAX On Hood Lacings Door Striker, Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen In Gasoline—Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING

or every 5000 miles (whichever occurs first)

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M-4664 if Required

(Y) Drain, Flush and Refill with GEAR OIL
Winter S.A.E. 90
Summer S.A.E. 140

(W) Remove and Clean Screen

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL·
Winter S.A.E. 90
Summer S.A.E. 140

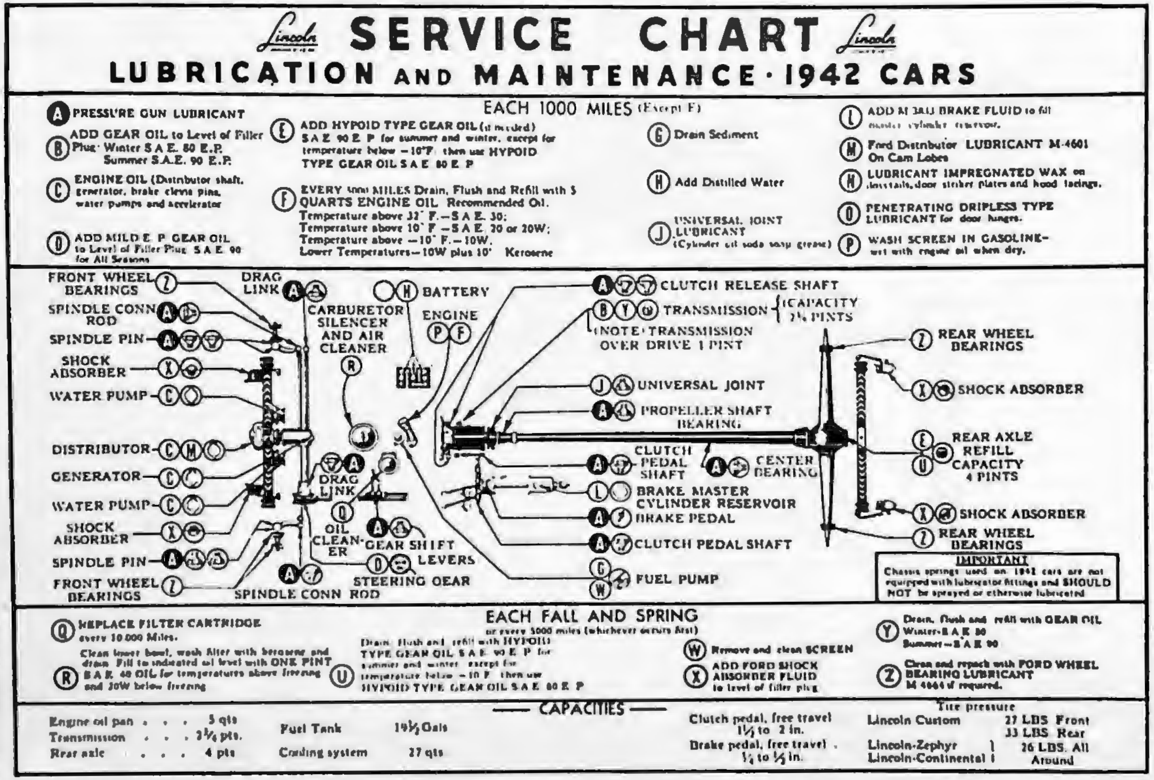
(S) Ford Distributor LUBRICANT M-4601 On Cam Lobes

CAPACITIES

Engine oil pan	5 qts.	Cooling system	24 qts.	Clutch pedal, free travel	1½ to 1¾ in.
Transmission	5 pts.	Fuel tank	22 gals.	Brake pedal, free travel	¼ to ½ in.
Rear axle	7 pts.	Tire pressures vary with tire size, see specifications.			

Ford Cab-over-Engine Truck Lubrication and Maintenance Chart
Fig. 2

Printed in U.S.A.



LINCOLN AND LINCOLN-ZEPHYR LUBRICATION AND MAINTENANCE CHART, 1942
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1942 MERCURY AND 8 CYLINDER FORD PASSENGER CARS

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Generator, Brake Clevis Pins and Accelerator)

(D) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug. Winter S.A.E. 80, Summer S.A.E. 90

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug. Winter S.A.E. 90, Summer S.A.E. 140 (In Steering Gear use S.A.E. 90 for All Seasons)

(F) Drain, Flush and Refill with 5 QUARTS ENGINE OIL EVERY 2000 MILES. Recommended Oil. Temperature above 32° F.—S.A.E. 30. Temperature above 10° F.—S.A.E. 20 or 20W; Temperature above —10° F.—10W. Lower Temperatures—10W plus 10% Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(J) UNIVERSAL JOINT LUBRICANT (Cylinder Oil Soda Soap Grease)

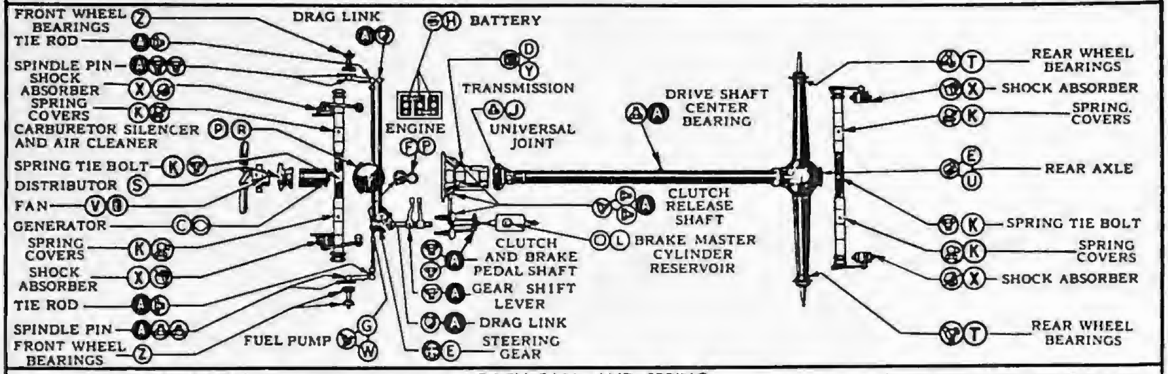
(K) FORD SPRING LUBRICANT M 4628

(L) ADD FORD BRAKE FLUID M 3833 —Correct Level 1/4" from Top

(N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen in Gasoline—Wet with Engine Oil When Dry



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(R) If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in "F"

(S) Ford Distributor LUBRICANT M 4601 On Cam Lobes

(T) FORD WHEEL BEARING LUBRICANT M 4664 Use hand gun sparingly

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Winter S.A.E. 90 Summer S.A.E. 140

(V) ADD ONE OUNCE ENGINE OIL S.A.E. 20 then Drain out surplus

(W) Remove and Clean Screen

(X) ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug

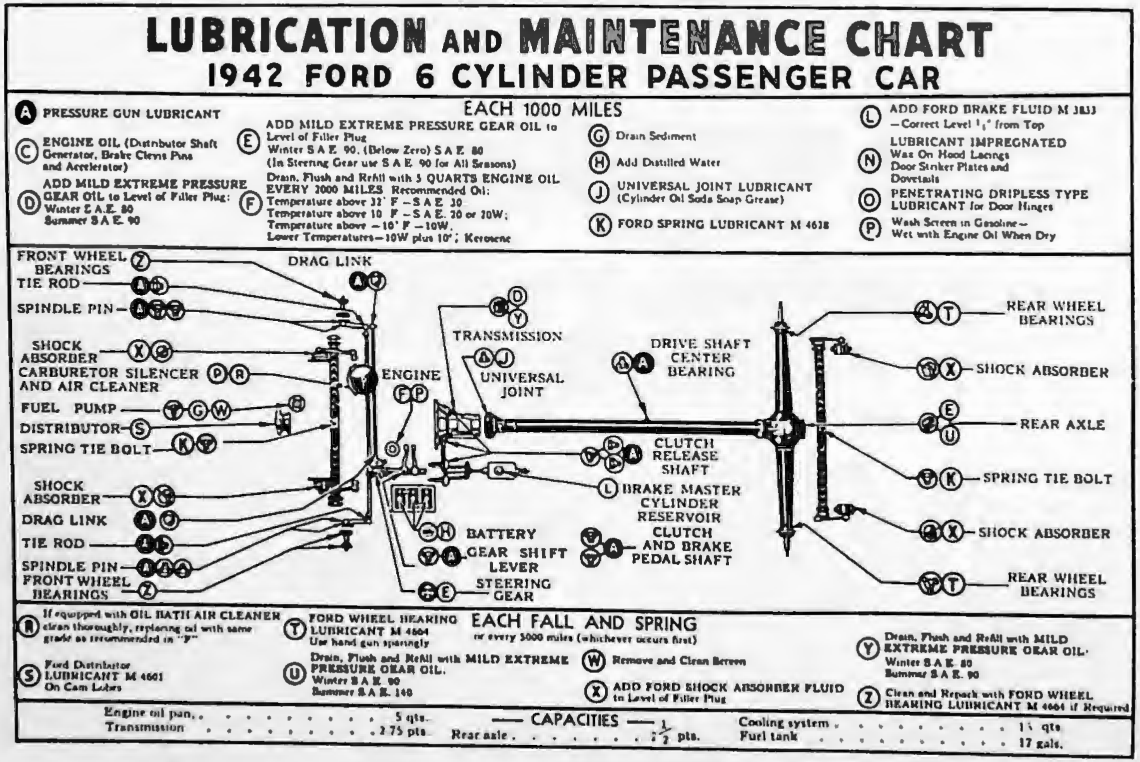
(Y) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Winter S.A.E. 80 Summer S.A.E. 90

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

— CAPACITIES —

Engine oil pan, V-8	5 qts.
Transmission	2.75 pts.
Cooling system, V-8	22 qts.
Fuel tank	17 gals.

Mercury and Ford V-8 Passenger Cars Lubrication and Maintenance Chart, 1942
Fig. 2



FORD 6 CYL. LUBRICATION AND MAINTENANCE CHART, 1942
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1942 FORD CAB-OVER-ENGINE TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug
Winter S A E 90
Summer S A E 140

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug. Winter S A E 90
Summer S A E 140 (In Steering Gear use S A E 90 for All Seasons)

(F) Every 2000 Miles Drain and Refill with ENGINE OIL
Atmospheric Temperature
Average Above 90° F . . . S A E 40
Minimum Above 32° F . . . S A E 30
Minimum Above 10° F . . . S A E 20 or 20W
Minimum Above −10° F . . . S A E 10 or 10W
Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(J) GEAR OIL, S A.E. 140

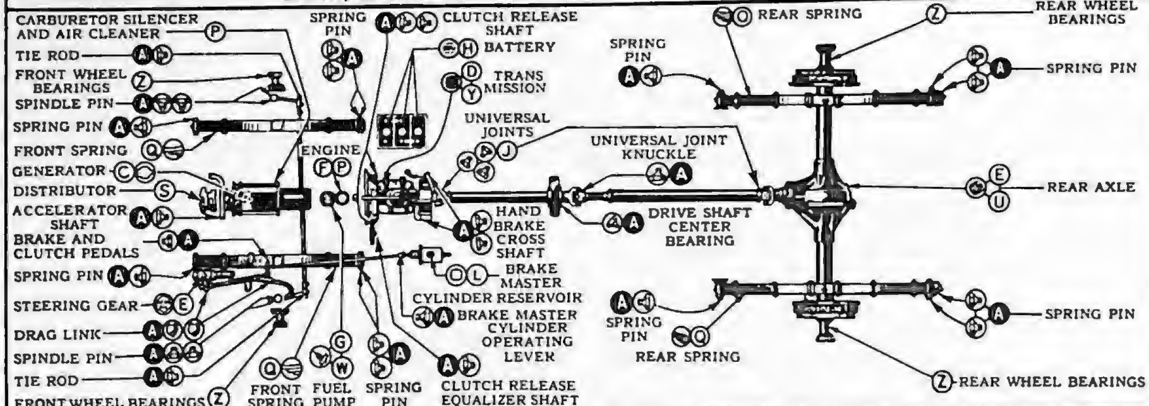
(L) ADD FORD BRAKE FLUID M 3833 —Correct Level ¼" from Top

(N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen in Gasoline— Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M-4664 if Required

(Y) Drain, Flush and Refill with GEAR OIL
Summer S A.E.140
Winter S A E 90

(W) Remove and Clean Screen

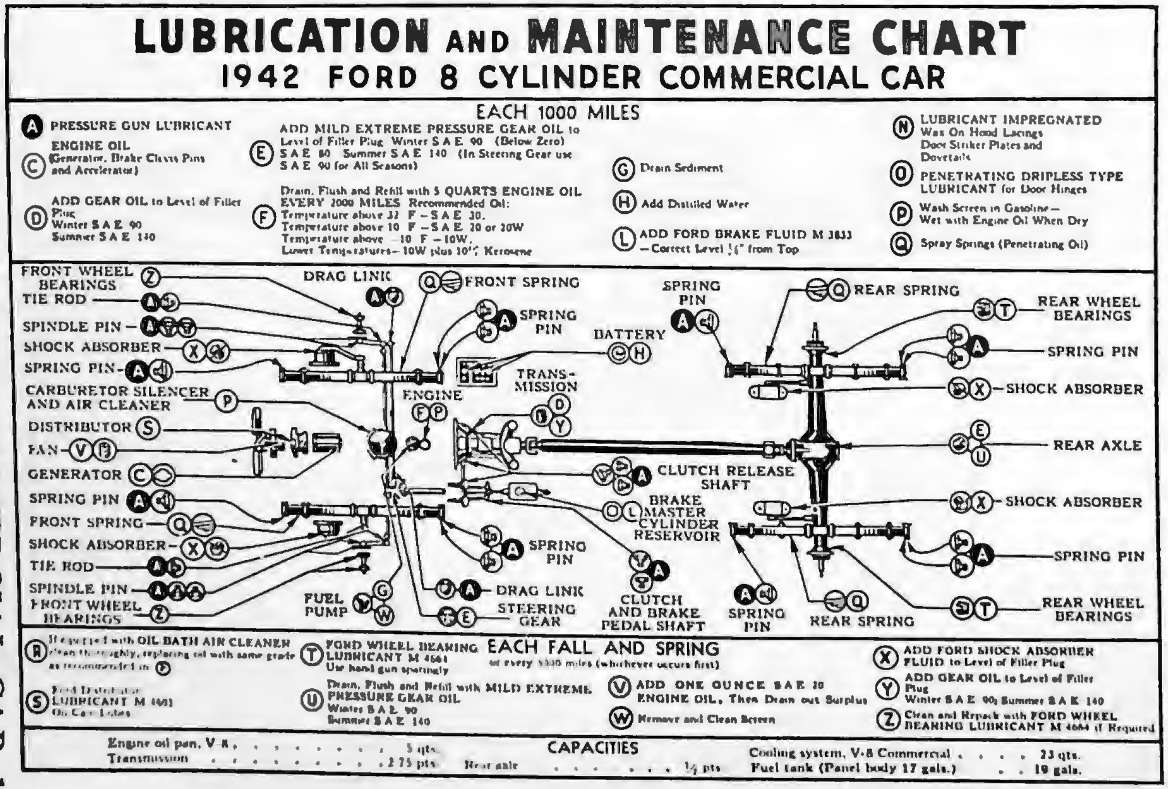
(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL.
Winter S A E 90
Summer S.A E. 140

(S) Ford Distributor LUBRICANT M 4601 On Cam Lobes

— CAPACITIES —

Engine oil pan, V-8	5 qts.			Cooling system	23 qts.
Transmission	5 pts.	Rear axle	7 pts	Fuel tank	22 gals.

Ford Cab-Over-Engine Truck Lubrication and Maintenance Chart, 1942
Fig. 2

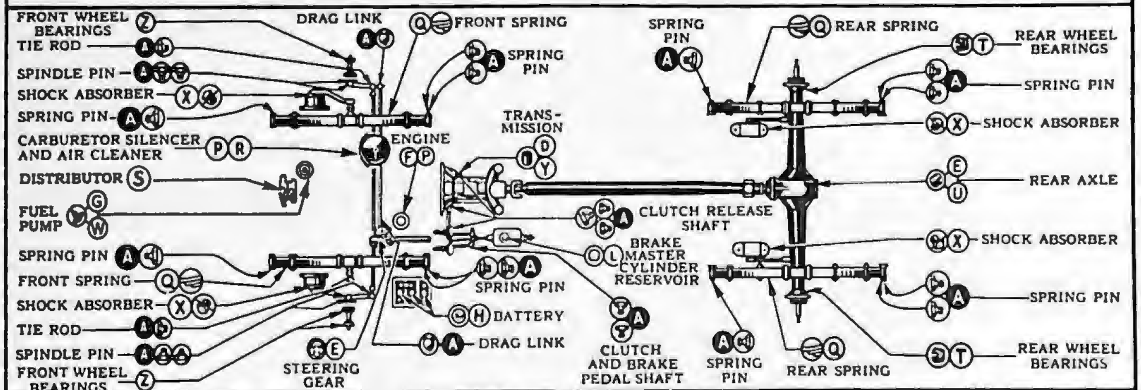


FORD V-8 COMMERCIAL CAR LUBRICATION AND MAINTENANCE CHART, 1942
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1942 FORD 6 CYLINDER COMMERCIAL CAR

EACH 1000 MILES

- (A) PRESSURE GUN LUBRICANT
- (C) ENGINE OIL (Brake Clevis Pins and Accelerator)
- (D) ADD GEAR OIL to Level of Filler Plug: Winter S.A.E. 90 Summer S.A.E. 140
- (E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug Winter S A E 90 (Below Zero) S A E 80 Summer S A E 140 (In Steering Gear use S A E 90 for All Seasons)
- (F) Drain, Flush and Refill with 5 QUARTS ENGINE OIL EVERY 2000 MILES. Recommended Oil: Temperature above 32° F.—S.A.E. 30. Temperature above 10° F.—S.A.E. 20 or 20W; Temperature above —10° F.—10W. Lower Temperatures—10W plus 10%, Kerosene
- (G) Drain Sediment
- (H) Add Distilled Water
- (L) ADD FORD BRAKE FLUID M 3833 —Correct Level ½" from Top
- (N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails
- (O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges
- (P) Wash Screen in Gasoline—Wet with Engine Oil When Dry
- (Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

- (R) If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in (F)
- (S) Ford Distributor LUBRICANT M 4601 On Cam Lobes
- (T) FORD WHEEL BEARING LUBRICANT M 4664 Use hand gun sparingly
- (U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Winter S A E 90 Summer S A E 140
- (W) Remove and Clean Screen
- (X) ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug
- (Y) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Winter S A E 80 Summer S A E 90
- (Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

CAPACITIES

Engine oil pan	5 qts.	Cooling system	16 ¾ qts.
Transmission	2.75 pts.	Fuel tank	15 gals.
Rear axle	2 ½ pts.		

FORD 6 CYL. COMMERCIAL CAR LUBRICATION AND MAINTENANCE CHART 1942
Fig. 2

LUBRICATION AND MAINTENANCE CHART
1942 FORD 8 CYLINDER ¾ TON AND TONNER TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug Summer S A E 140 Winter S A E 90 (Below Zero) S A E 80

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug: Winter S A E 90 (Below Zero) S A E 80 Summer S A E. 140 (In Steering Gear use S A.E. 90 for All Seasons)

(F) Every 2000 Miles Drain and Refill with ENGINE OIL
Atmospheric Temperature
Average Above 90° F . . . . S A E 40
Minimum Above 32° F . . . . S A E 30
Minimum Above 10° F . . . . S A E 20 or 20W
Minimum Above −10° F . . . S A E 10 or 10W
Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(J) GEAR OIL. S A E. 140

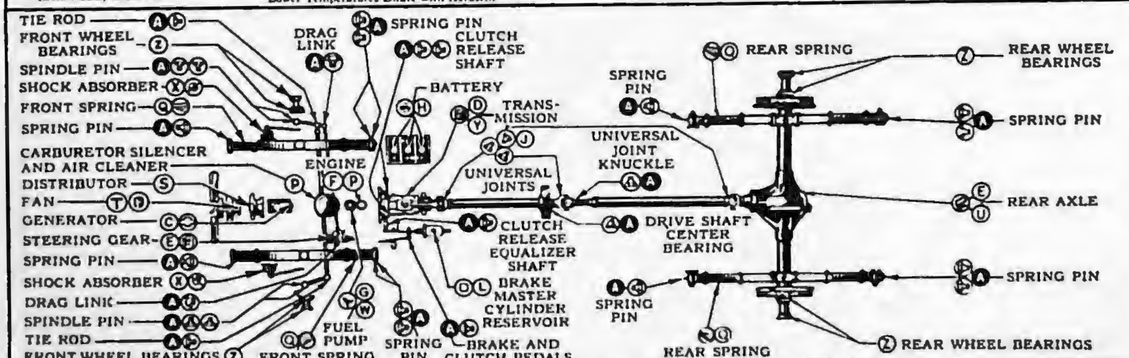
(L) ADD FORD BRAKE FLUID M-3833 —Correct Level ¼" from Top

(N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen in Gasoline—Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(R) If equipped with OIL BATH AIR CLEANER clean thoroughly, replacing oil with same grade as recommended in "F"

(S) Ford Distributor LUBRICANT M 4601 On Cam Lobes

(T) Fan S A E 10W Winter and Summer

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL Summer S A E 140 Winter S A E 90 Winter (Below Zero) S A E 80

(W) Remove and Clean Screen

(X) ADD FORD SHOCK ABSORBER FLUID to Level of Filler Plug

(Y) Drain, Flush and Refill with GEAR OIL Summer S A E 140 (Below Zero) S A E 80 Winter S A E 90

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required

CAPACITIES

Engine oil pan, V-8	5 qts.	Cooling system, V-8	23 qts.
Transmission	2.75 pts.	Fuel tank (Panel Body 17 gals.)	19 gals.
Rear axle	3 pts.		

V-8 Ford ¾ Ton and Tonner Lubrication and Maintenance Chart, 1942
Fig. 1

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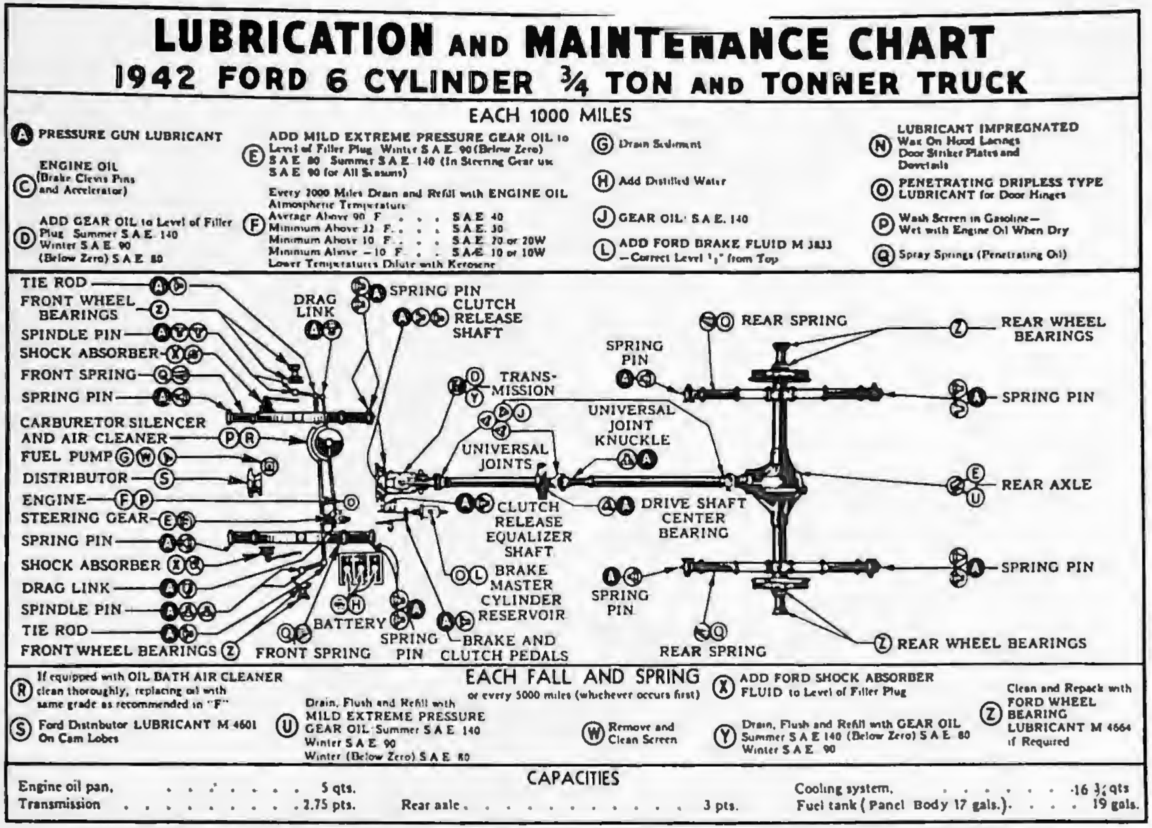
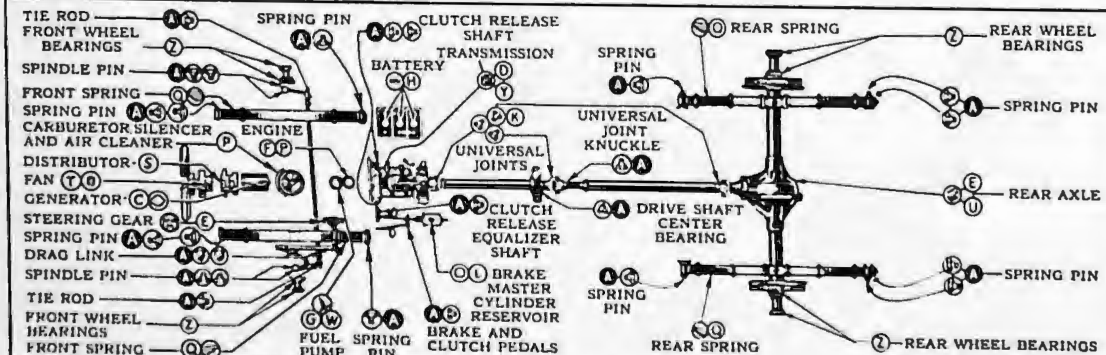


6 Cyl. Ford ¾ Ton and Tonner Lubrication and Maintenance Chart 1942
Fig. 2

LUBRICATION AND MAINTENANCE CHART
1942 FORD 8 CYLINDER REGULAR TRUCK

EACH 1000 MILES

- (A) PRESSURE GUN LUBRICANT
- (C) ENGINE OIL (Distributor Shaft Generator, Brake Clevis Pins and Accelerator)
- (D) ADD GEAR OIL to Level of Filler Plug Winter S A E 90 Summer S A E 140
- (E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug Winter S A E 90 Summer S A E 140 (In Steering Gear use S A E. 90 for All Seasons)
- (F) Every 2000 Miles Drain and Refill with ENGINE OIL Atmospheric Temperature
  - Average Above 90° F . . . S A E. 40
  - Minimum Above 32° F. . . . S A E 30
  - Minimum Above 10° F. . . . S A E 20 or 20W
  - Minimum Above −10° F. . . . S A E. 10 or 10W
  - Lower Temperatures Dilute with Kerosene
- (G) Drain Sediment
- (H) Add Distilled Water
- (K) GEAR OIL S A E. 140
- (L) ADD FORD BRAKE FLUID M 3833 —Correct Level ¼" from Top
- (N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails
- (O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges
- (P) Wash Screen in Gasoline— Wet with Engine Oil When Dry
- (Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

- (Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M 4664 if Required
- (Y) Drain Flush and Refill with GEAR OIL Summer S A E. 140 Winter S A E. 90
- (W) Remove and Clean Screen
- (T) ENGINE OIL S A E 20W.
- (U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL· Winter S A E. 90 Summer S A E 140
- (S) Ford Distributor LUBRICANT M 4601 On Cam Lobes

CAPACITIES

Engine oil pan, V-8	5 qts.	Cooling system	23 qts.
Transmission	5 pts.	Fuel tank	19 gals.
Rear axle	7 pts.		

Ford V-8 Regular Truck Lubrication and Maintenance Chart, 1942
Fig. 1

LUBRICATION AND MAINTENANCE CHART
1942 FORD 6 CYLINDER REGULAR TRUCK

EACH 1000 MILES

(A) PRESSURE GUN LUBRICANT

(C) ENGINE OIL (Brake Clevis Pins and Accelerator)

(D) ADD GEAR OIL to Level of Filler Plug
Winter S A E 90
Summer S A E 140

(E) ADD MILD EXTREME PRESSURE GEAR OIL to Level of Filler Plug Winter S A E 90
Summer S A E 140 (In Steering Gear use S A E. 90 for All Seasons)

(F) Every 2000 Miles Drain and Refill with ENGINE OIL
Atmospheric Temperature
Average Above 90 F . . . S A E. 40
Minimum Above 32° F . . . S A E. 30
Minimum Above 10° F . . . S A E. 20 or 20W
Minimum Above −10 F . . . S A E. 10 or 10W
Lower Temperatures Dilute with Kerosene

(G) Drain Sediment

(H) Add Distilled Water

(K) GEAR OIL: S A E. 140

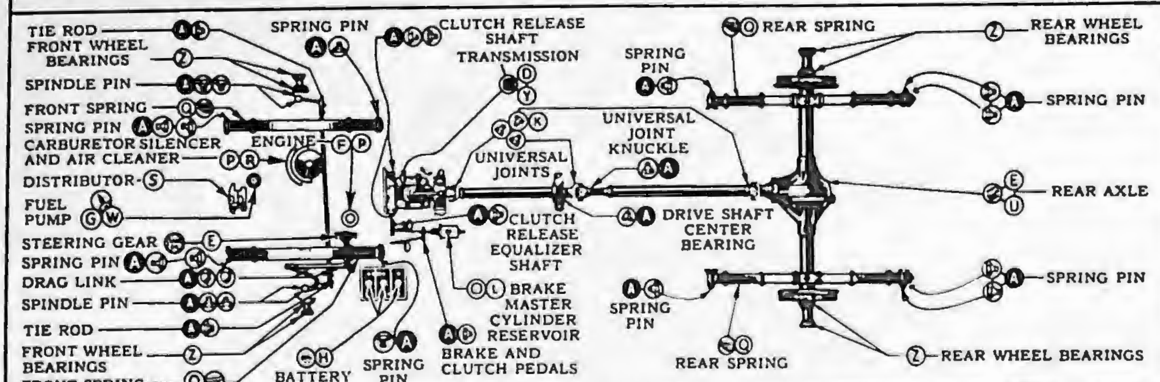
(L) ADD FORD BRAKE FLUID M-3833 —Correct Level ½" from Top

(N) LUBRICANT IMPREGNATED Wax On Hood Lacings Door Striker Plates and Dovetails

(O) PENETRATING DRIPLESS TYPE LUBRICANT for Door Hinges

(P) Wash Screen in Gasoline—Wet with Engine Oil When Dry

(Q) Spray Springs (Penetrating Oil)



EACH FALL AND SPRING
or every 5000 miles (whichever occurs first)

(Z) Clean and Repack with FORD WHEEL BEARING LUBRICANT M-4664 if Required

(Y) Drain, Flush and Refill with GEAR OIL
Summer S.A E. 140
Winter S A.E. 90

(W) Remove and Clean Screen

(U) Drain, Flush and Refill with MILD EXTREME PRESSURE GEAR OIL·
Winter S A E. 90
Summer S A E. 140

(S) Ford Distributor LUBRICANT M-4601 On Cam Lobes

CAPACITIES

Engine oil pan,	5 qts.			Cooling system	17 ¼ qts.
Transmission	5 pts.	Rear axle	7 pts.	Fuel tank	19 gals.

6 Cyl. Regular Truck Lubrication and Maintenance Chart, 1942
Fig. 2

1000 MILES — Water pumps
ENGINE OIL

5000 MILES — Shock absorber
Add FORD SHOCK ABSORBER FLUID M-4633-B.

1000 MILES — Drag link
PRESSURE GUN GREASE.

1000 MILES - Spindle
PRESSURE GUN GREASE.

10,000 MILES — Front wheel bearings
Repack with FORD WHEEL BEARING LUBRICANT — M-4664 once a year or at least every 10,000 miles.

1000 MILES - Tie rod
PRESSURE GUN GREASE.

1000 MILES - Steering gear case
Add as required mild E. P. GEAR OIL, S.A.E. 90, for all seasons.

5000 MILES — Hydraulic window lift reservoir and motor
With all windows open add FORD BRAKE FLUID M-3833 to level of reservoir filler spout. CAUTION Do not use mineral oil.
Apply 3 to 4 drops S.A.E. 10 ENGINE OIL in oil hole, top of motor.
Each Fall drain reservoir and clean with ALCOHOL. Do not use cleaning fluid. Refill to level of filler spout with FORD BRAKE FLUID M-3833

1000 MILES - Gear shift levers
PRESSURE GUN GREASE.

3500 MILES — Engine
Check oil level daily, replenish as required. Drain oil pan and refill with 5 qts. ENGINE OIL, four times a year or at least every 3500 miles.
Min. temp. above +32°F—S.A.E. 30
Min. temp. above +10°F—S.A.E. 20 or 20W
Min. temp. above −10°F—S.A.E. 10 or 10W
Lower temps. —10W plus 10% KEROSENE

5000 MILES — Clutch release shaft
PRESSURE GUN GREASE.

1000 MILES - Clutch and brake pedals
PRESSURE GUN GREASE.

1000 MILES — Clutch pedal shaft
PRESSURE GUN GREASE.

5000 MILES — Brake master cylinder
Add FORD BRAKE FLUID M-3833 (correct level ¼" from top).

1000 MILES — Drive shaft front bearing
PRESSURE GUN GREASE.

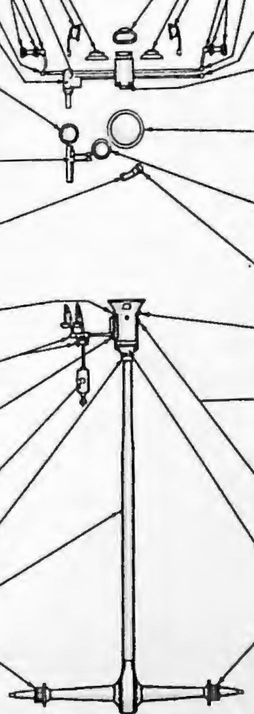
1000 MILES - Drive shaft center bearing
PRESSURE GUN GREASE.

10,000 MILES - Rear wheel bearing
Repack with FORD WHEEL BEARING LUBRICANT—M-4664 once a year or at least every 10,000 miles.

5000 MILES - Shock absorber
Add FORD SHOCK ABSORBER FLUID M-4633-B.

1000 MILES — Rear axle
Add HYPOID GEAR OIL to level of filler plug, S.A.E. 90 E.P. Summer and Winter (temp. below —10°F, use HYPOID GEAR OIL S.A.E. 80 E.P.).

Body and Hood
*1000 MILES—Door hinges.
PRESSURE GUN GREASE.
(Lincoln Continental
DRIPLESS PENETRATING OIL.)
1000 MILES—Door striker plates & dove tails.
IMPREGNATED WAX.
1000 MILES—Hood latch.
PRESSURE GUN GREASE.



5000 MILES — Distributor
Few drops of ENGINE OIL.

1000 MILES — Water pumps
ENGINE OIL.

5000 MILES - Shock absorber
Add FORD SHOCK ABSORBER FLUID M-4633-B.

1000 MILES— Spindle
PRESSURE GUN GREASE.

10,000 MILES—Front wheel bearings
Repack with FORD WHEEL BEARING LUBRICANT—M-4664 once a year or at least every 10,000 miles.

1000 MILES—Tie rod
PRESSURE GUN GREASE.

1000 MILES-Drag link
PRESSURE GUN GREASE.

1000 MILES — Generator
ENGINE OIL—S.A.E. 20

3500 MILES — Oil bath air cleaner
Remove cleaner—clean and refill sump to level mark with ENGINE OIL (same grade as used in engine) each time oil pan is drained, more frequently under severe dust conditions. Do not immerse silencer body in cleaning fluid. Occasionally wash filter assembly in cleaning fluid.

5000 MILES — Oil filter
Replace FILTER CARTRIDGE. After replacing cartridge, run engine, check for leaks at filter and recheck oil level.

1000 MILES—Breather cap
Wash screen in gasoline—wet with ENGINE OIL when dry.

5000 MILES— Clutch release shaft
PRESSURE GUN GREASE.

1000 MILES—Transmission
Add mild E.P. GEAR OIL to level of filler plug also in Overdrive Unit if so equipped.
SUMMER—S.A.E. 90 WINTER—S.A.E. 80

5000 MILES - Transmission
Drain, flush and refill with 2¾ pints mild E.P. GEAR OIL, also one pint in Overdrive Unit if so equipped, twice yearly or at least every 5000 miles.
SUMMER—S.A.E. 90 WINTER—S.A.E. 80

1000 MILES—Universal joint
UNIVERSAL JOINT LUBRICANT (cylinder oil soda soap grease).

10,000 MILES-Rear wheel bearing
Repack with FORD WHEEL BEARING LUBRICANT—M-4664 once a year or at least every 10,000 miles.

5000 MILES - Shock absorber
Add FORD SHOCK ABSORBER FLUID M-4633-B.

5000 MILES —Rear axle
Drain, flush and refill with 4 pints HYPOID GEAR OIL S.A.E. 90 E.P. Summer and Winter (temp. below —10°F use HYPOID GEAR OIL S.A.E. 80 E.P.)

S-130

*Door hinge fittings are accessible from under side of car

LINCOLN 1945-7

July 7, 1947

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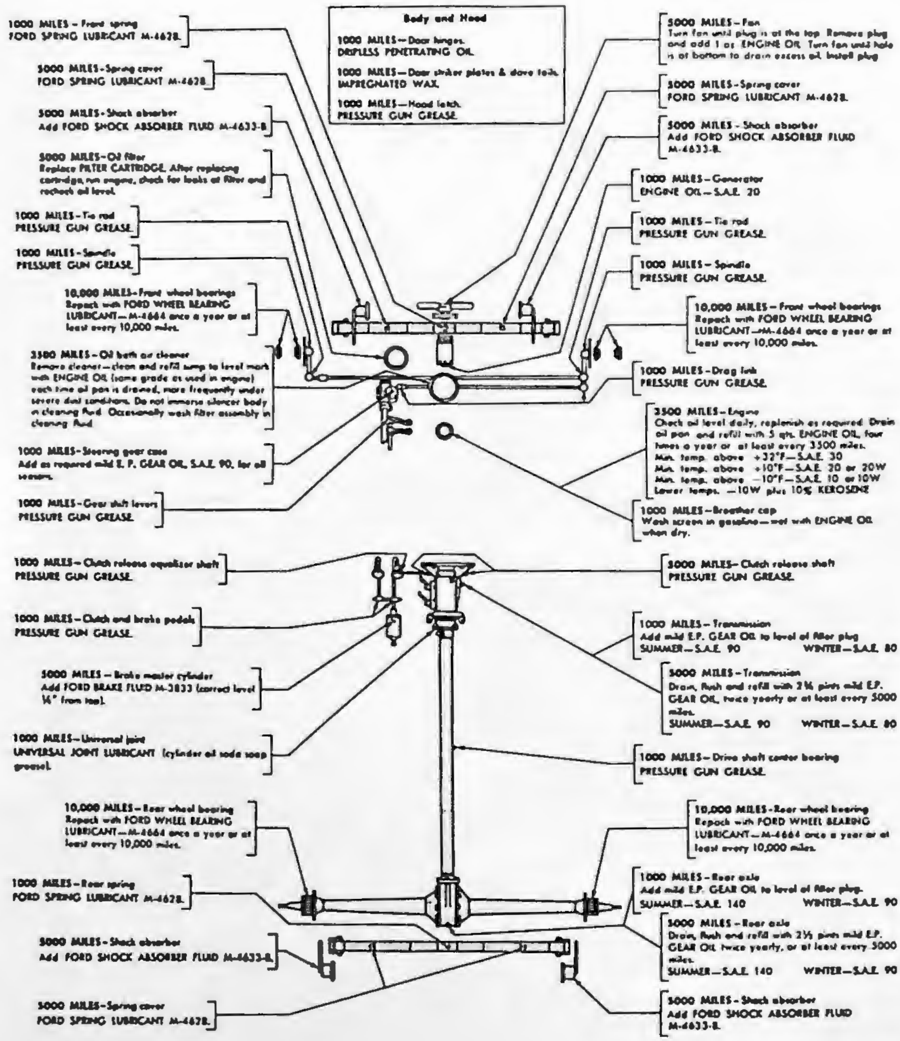
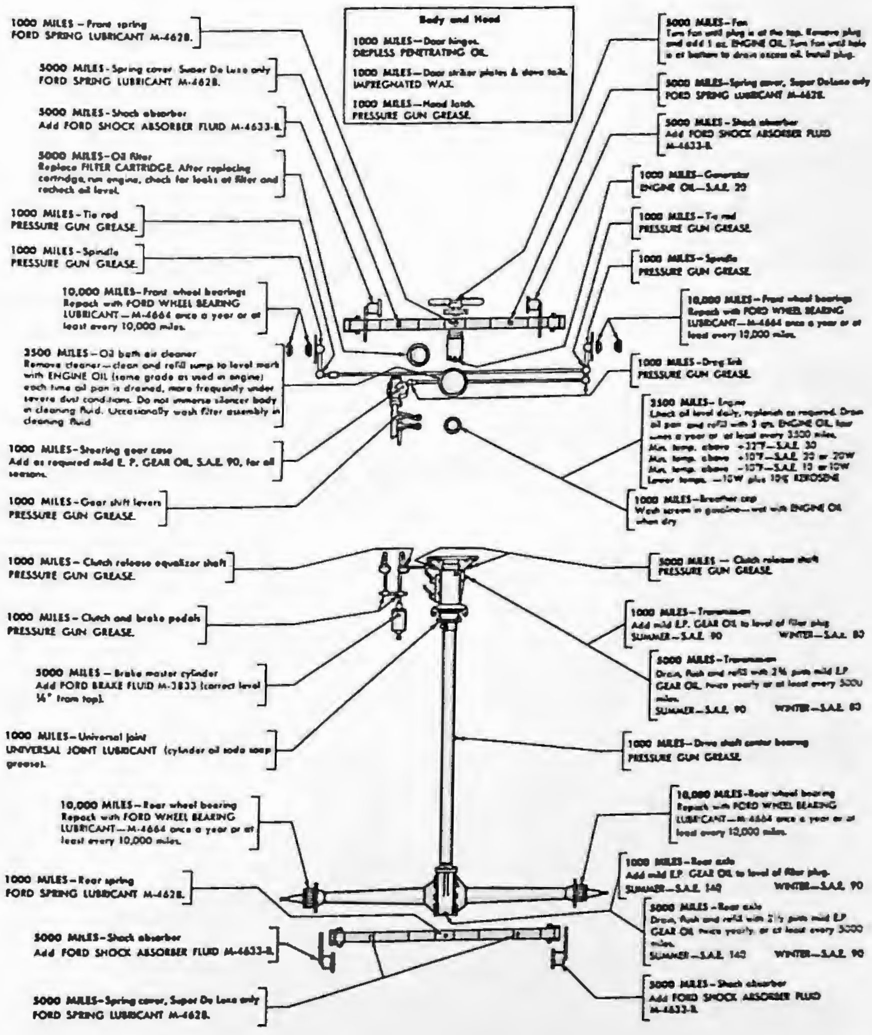
Subject No. MA-5000 LUBRICATION Page No. 148



B-149

MERCURY 1945-7

July 7, 1947



B-147

FORD V-8 PASSENGER CAR 1945-7

July 7, 1947

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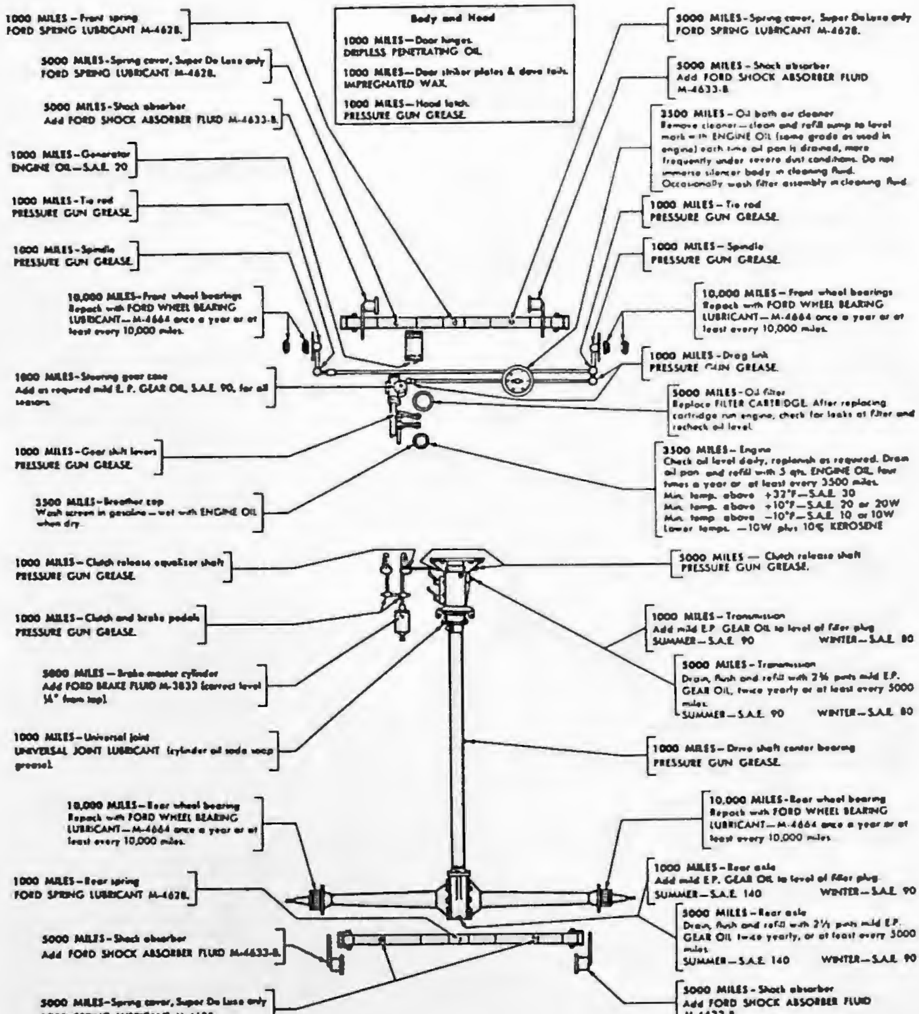
CARS TRUCKS BUSSES

DEALERS' MAINTENANCE SERVICE BULLETIN

Ford Mercury Lincoln

Subject No. MA-5000 **LUBRICATION** **Page No. 150**



FORD 6-CYL. PASSENGER CAR 1945-7

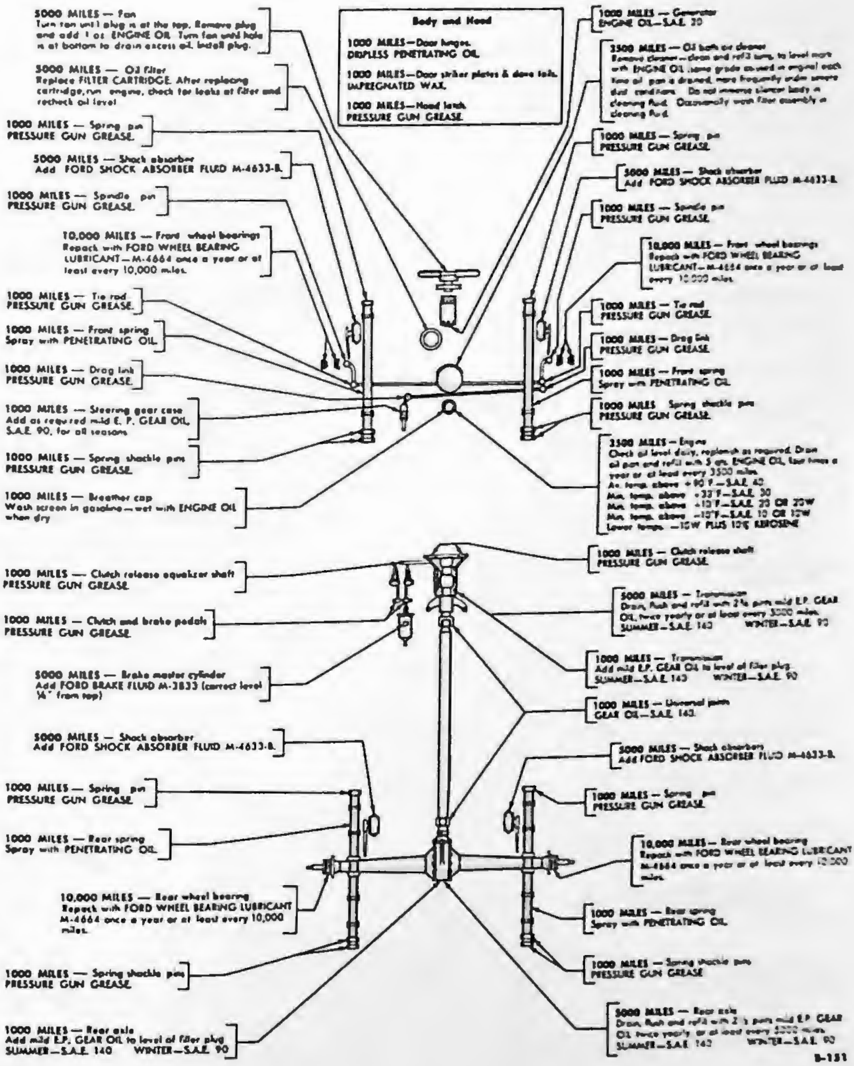
July 7, 1947

CARS TRUCKS BUSSES

DEALERS' MAINTENANCE SERVICE BULLETIN

FORD MERCURY LINCOLN

Page No. 151 **LUBRICATION** **Subject No. MA-5000**



FORD V-8 LIGHT DUTY TRUCK 1945-7

July 7, 1947

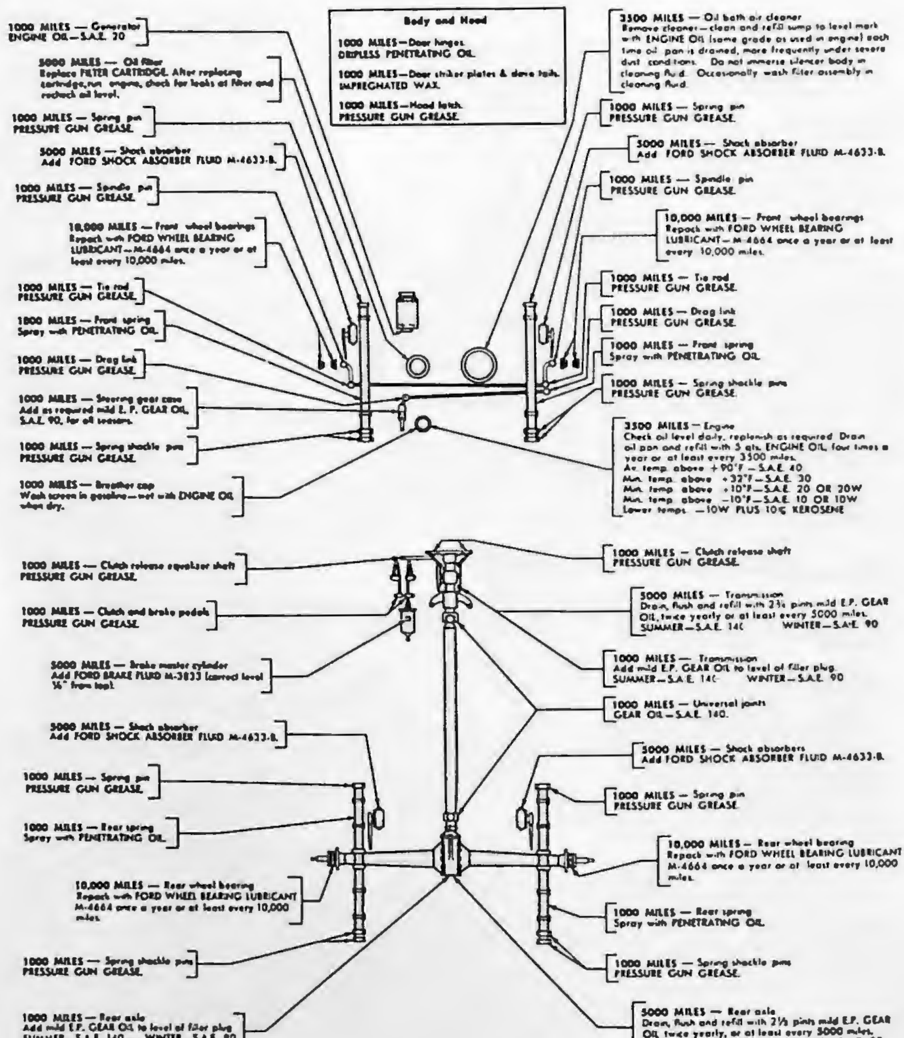
PRINTED IN U.S.A.

CARS TRUCKS BUSSES

DEALERS' MAINTENANCE SERVICE BULLETIN

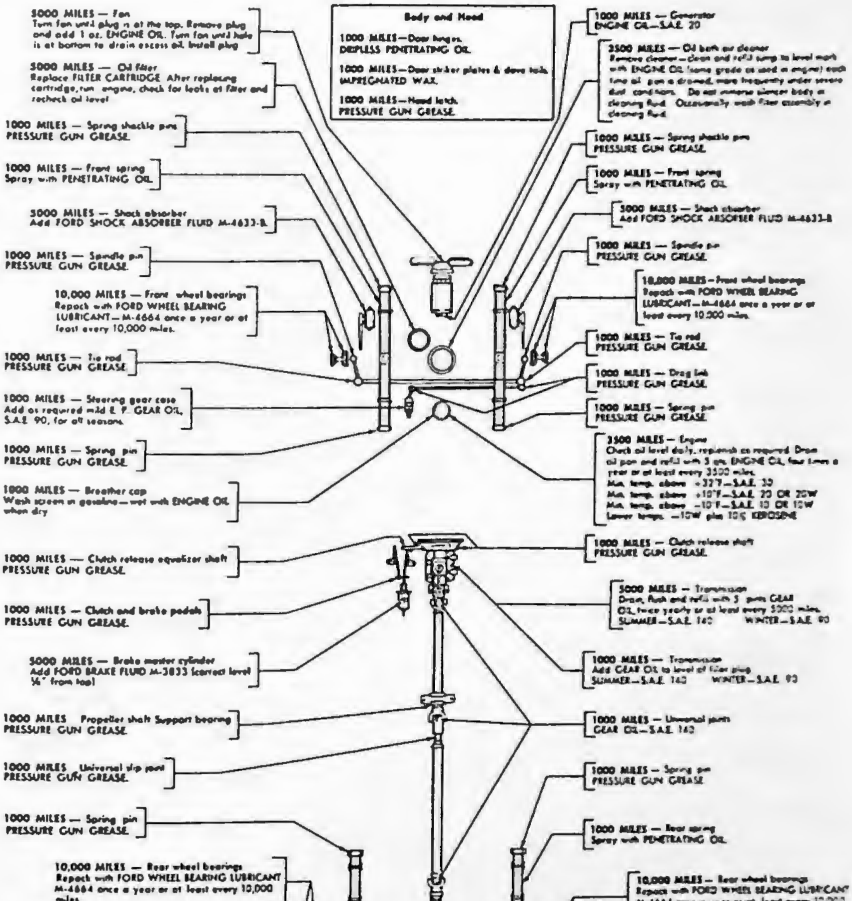
Ford Mercury Lincoln

Subject No. MA-5000 LUBRICATION Page No. 152



FORD 6-CYL. LIGHT DUTY TRUCK 1945-7

July 7, 1947



FORD V-8 ONE TON TRUCK 1945-7

July 7, 1947

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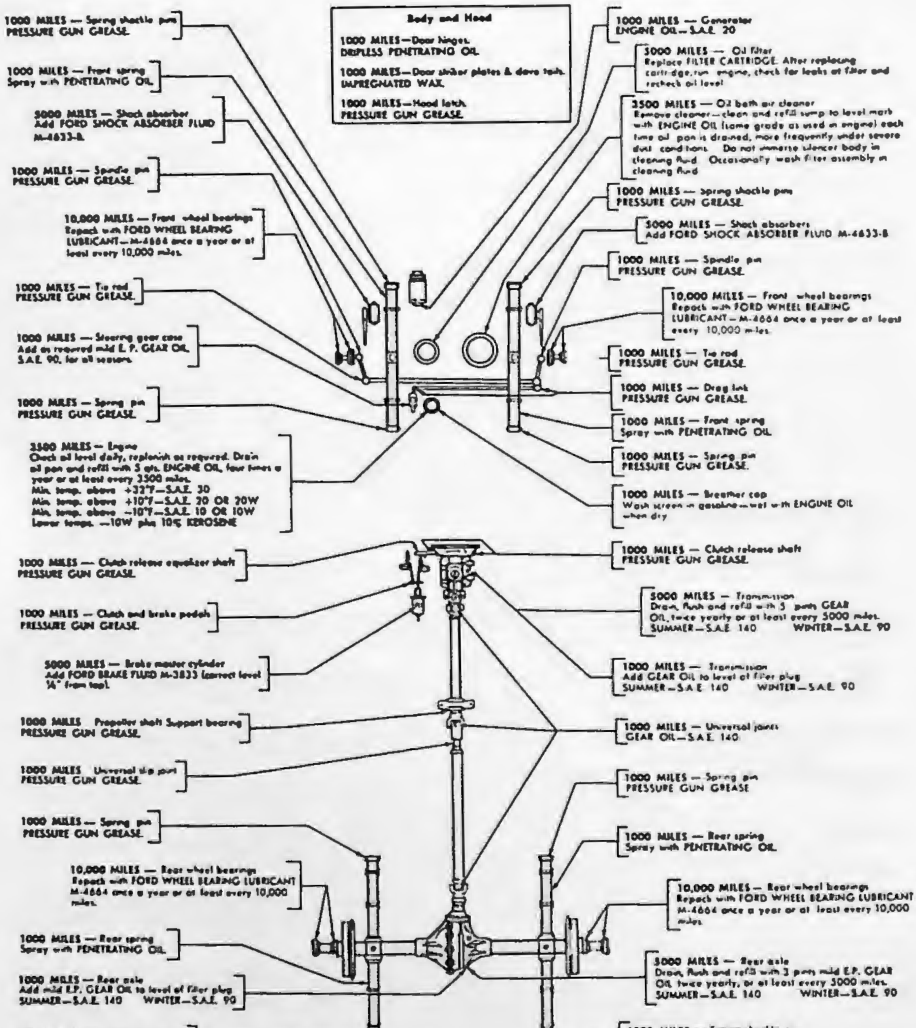


FORD 6-CYL. ONE TON TRUCK 1945-7

July 7, 1947

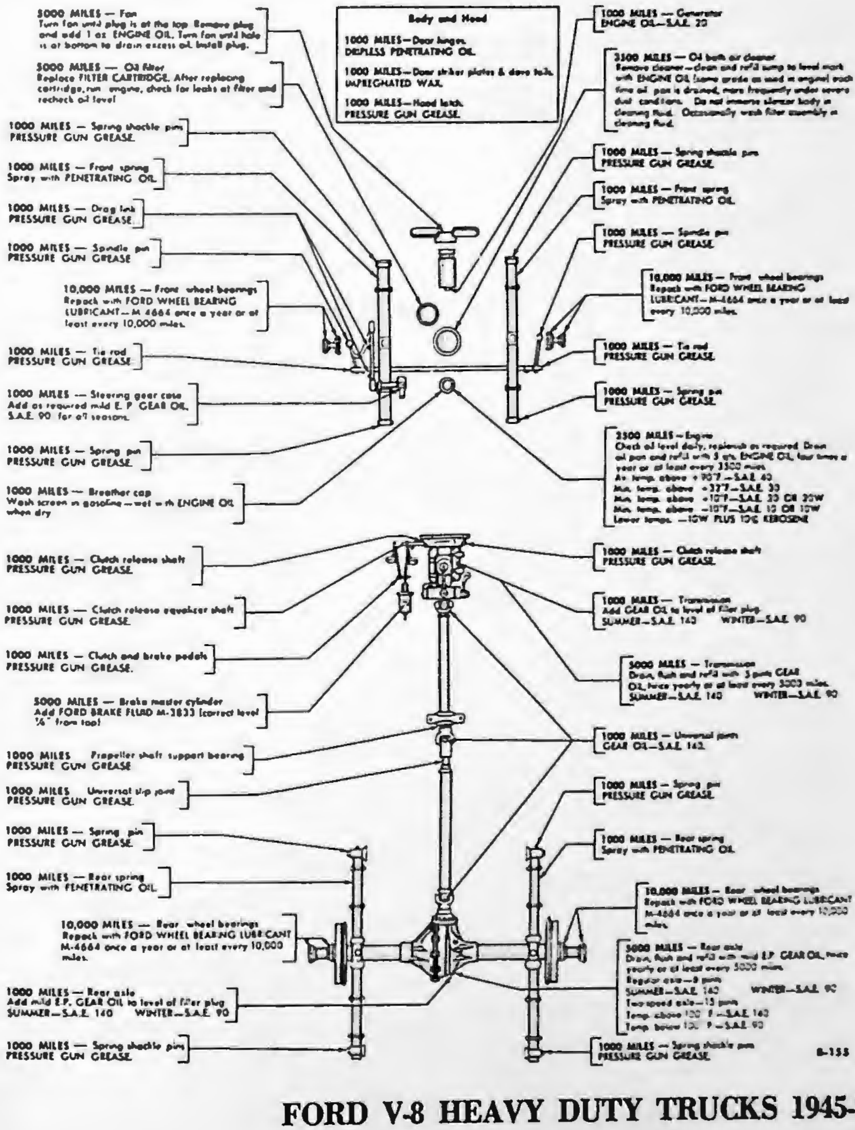
CARS TRUCKS BUSSES

DEALERS'

MAINTENANCE

SERVICE BULLETIN

Ford MERCURY LINCOLN



FORD V-8 HEAVY DUTY TRUCKS 1945-7

July 7, 1947

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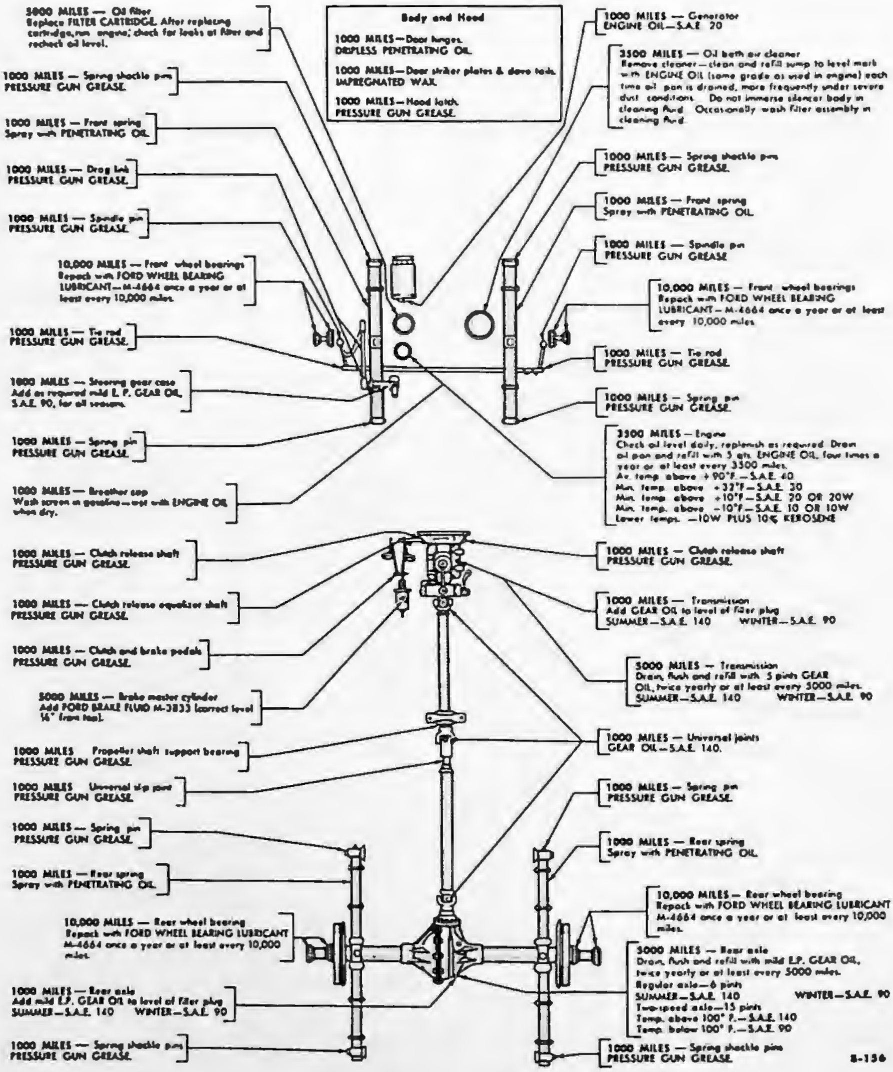
CARS TRUCKS BUSSES

DEALERS'
MAINTENANCE
SERVICE BULLETIN

Ford Mercury Lincoln



FORD 6-CYL. HEAVY DUTY TRUCKS 1945-7

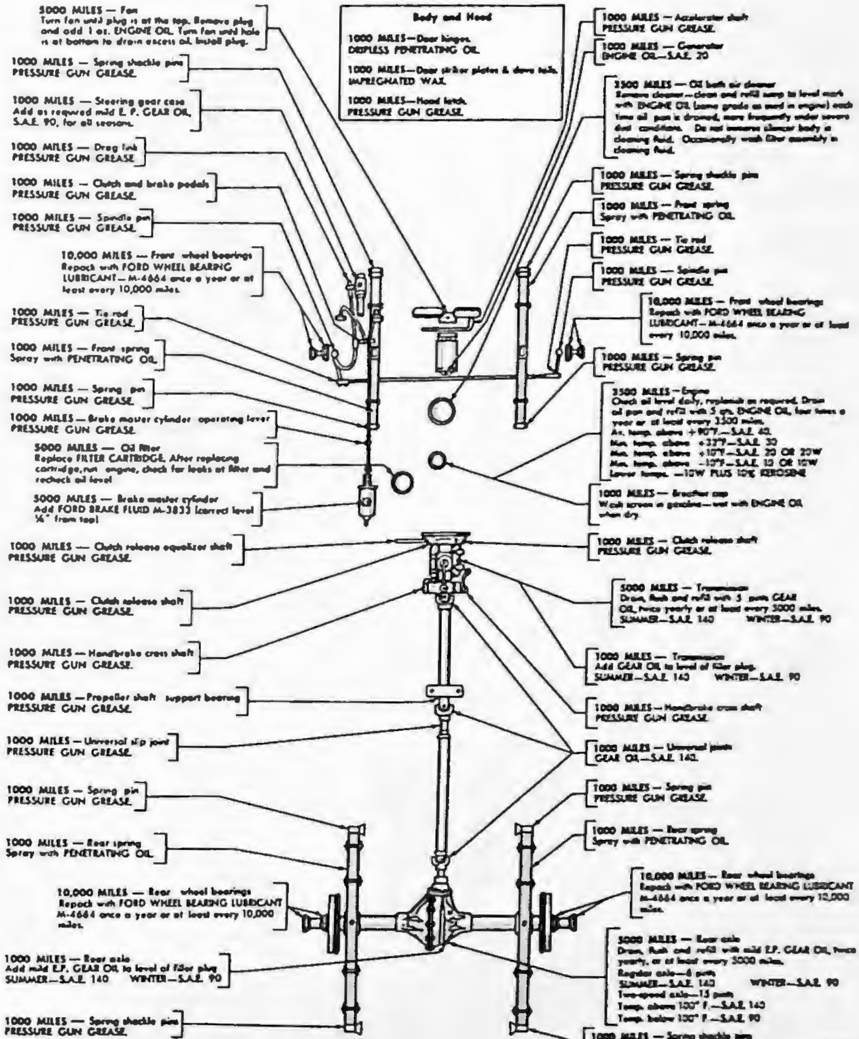
July 7, 1947

CARS TRUCKS BUSSES

DEALERS'
MAINTENANCE
SERVICE BULLETIN

Ford MERCURY LINCOLN

Page No. 157 **LUBRICATION** **Subject No. MA-5000**



CAB-OVER-ENGINE 1945-47

July 17, 1947

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CARS TRUCKS BUSSES

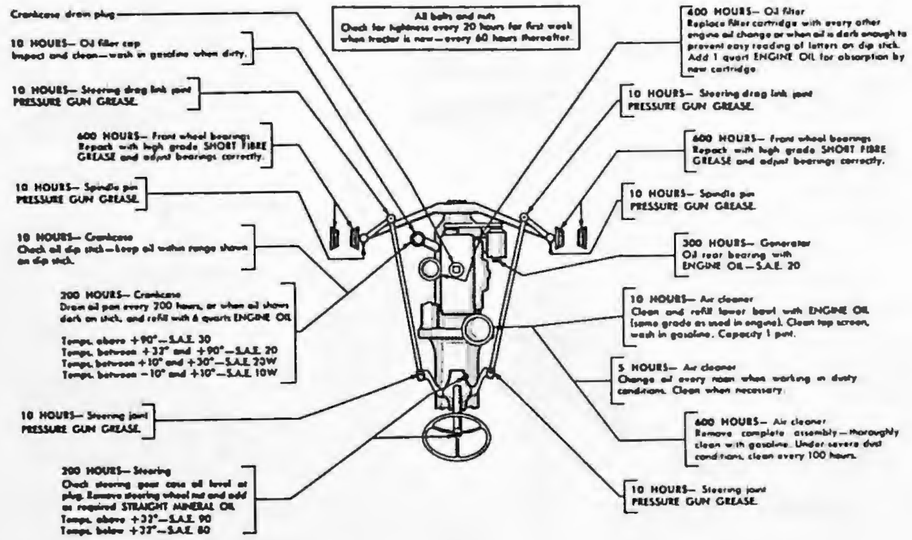
DEALERS'

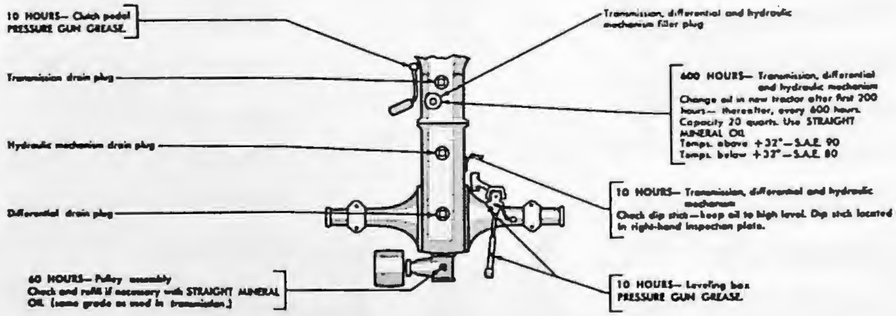
MAINTENANCE

SERVICE BULLETIN

Ford Mercury Lincoln

Subject No. MA-5000 **LUBRICATION** **Page No. 158**





B-206

TRACTOR 1948

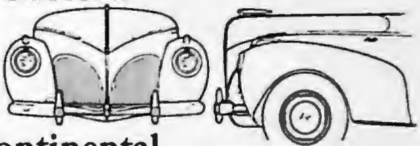
July 17, 1947

MODEL IDENTIFICATION 1941

Lincoln Custom

Model 168H

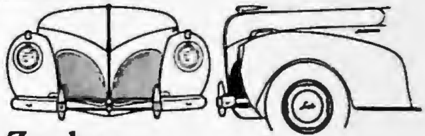
Lincoln, V-12 Engine. Approx. Wgt., Lim. 4270 lbs.
138" Wheelbase Length, Bumper to Bumper, 225.25"
149" Springbase Width, overall, 75.0"



Lincoln-Continental

Model 16H

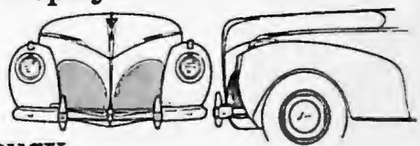
Lincoln, V-12 Engine Approx. Wgt., Cab., 3860 lbs.
125" Wheelbase Length, Bumper to Bumper 209.8"
136" Springbase Width, overall, 73.38"



Lincoln-Zephyr

Model 16H

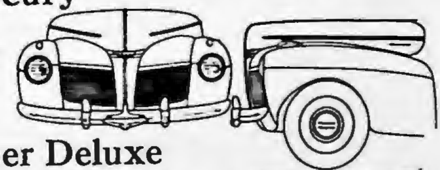
Lincoln, V-12 Engine Approx. Wgt., Sedan 3710 lbs
125" Wheelbase Length, Bumper to Bumper, 209.8"
136" Springbase Width, overall, 73.38"



Mercury

Model 19A

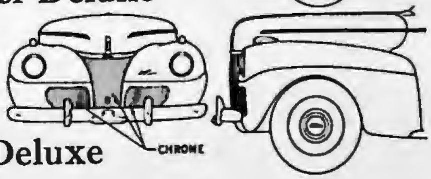
Mercury, V-8 Engine Approx. Wgt., Tn. Sed., 3221 lbs.
118" Wheelbase Length, Bumper to Bumper, 200.61"
129.38" Springbase Width, overall, 73.12"



Ford Super Deluxe

Model 11A

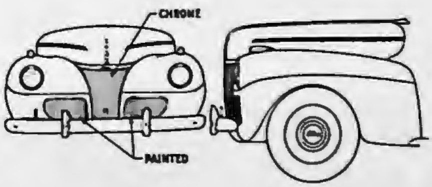
Ford, V-8 Engine Approx. Wgt., Fordor, 3146 lbs.
114" Wheelbase Length, Bumper to Bumper, 194.34"
125.38" Springbase Width, overall, 73.12"



Ford Deluxe

Model 11A

Ford, V-8 Engine Approx. Wgt., Fordor, 3121 lbs.
114" Wheelbase Length, Bumper to Bumper, 194.34"
125.38" Springbase Width, overall, 73.12"



Model 1GA

Ford, 6 Cyl. Eng. Approx. Wgt., Fordor, 3100 lbs.
114" Wheelbase Length, Bumper to Bumper, 194.34"
125.38" Springbase Width, overall, 73.12"

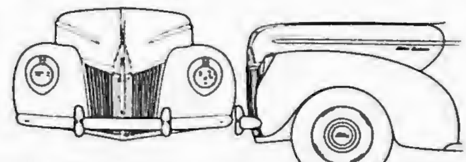
Printed in U.S.A.

June 6, 1941

Ford Commercial Cars

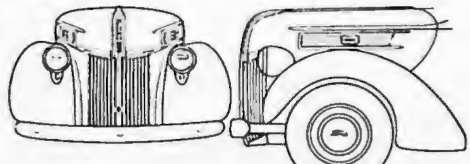
Models	Engine	Approx. Weight Pickup	Wheelbase
11C	Ford V-8	2745 lbs.	112"
1GC	Ford 6 cyl.	2732 lbs.	112"
1NC	Ford 4 cyl.	2575 lbs.*	112"

Springbase 123.13"
Length bumper to bumper 183.7"



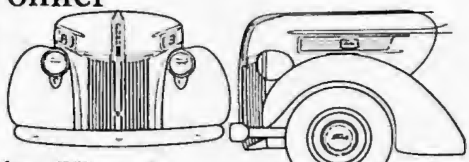
3/4 Tonner

Models	Engine	Approx. Weight Pickup	Wheelbase
11D	Ford V-8	3272 lbs.	122"
1GD	Ford 6 cyl.	3252 lbs.	122"
1ND	Ford 4 cyl.	3105 lbs.	122"



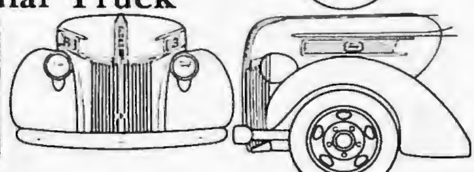
Ford Tonner

Model and Engine			Wheelbase	Approx. Weight With Express Pick-Up Body		
V-8 Ford	6 Cyl. Ford	4 Cyl. Ford		V-8 Ford	6 Cyl. Ford	4 Cyl. Ford
11Y	1GY	1NY	122"	3442	3420	3272



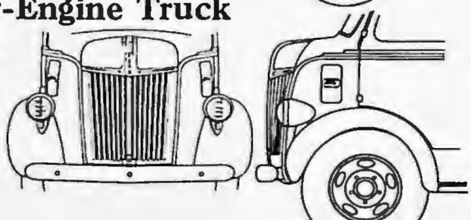
Ford Regular Truck

Model and Engine			Wheelbase	Approx. Weight With Stake Body		
V-8 Ford	V-8 Mercury	6 Cyl. Ford		V-8 Ford	V-8 Mercury	6 Cyl. Ford
11T	19T	K-F	134"	4461	4461	4439
118T	119T	1C18	158"	4787	4787	4765
11U†	19U†	1GU†	134"	4805	4805	4783



Ford Cab-Over-Engine Truck

Model and Engine			Wheelbase	Approx. Weight With Chassis and Closed Cab		
V-8 Ford	V-8 Mercury			V-8 Ford	V-8 Mercury	
111W	191W		101"	3547	3547	
11W	19W		134"	3624	3624	
118W	198W		158"	3701	3701	



Bus

Model 19B Rear Engine Bus Chassis
Mercury V-8 Engine — Wheelbase 148½"

Model 1G4T School Bus Chassis
Ford, 6 Cyl. Engine — Wheelbase 194"

Model 114T School Bus Chassis
Ford V-8 Engine — Wheelbase 194"

Model 194T School Bus Chassis
Mercury Engine — Wheelbase 194"

*Weights given for trucks with single rear wheels—standard springs.
† Dump Chassis ‡ With "WOOD" (Mfg.) dump body, closed cab and auxiliary springs

June 6, 1941

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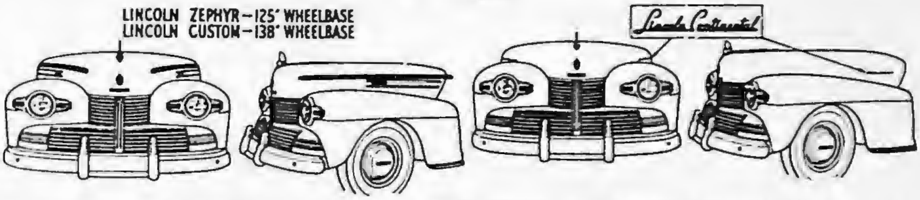
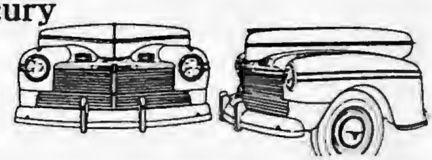
MODEL IDENTIFICATION 1942

Lincoln



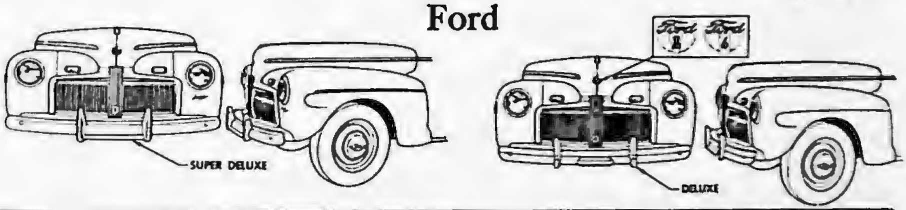
Type	Model	Approximate Weight	Wheelbase	Length Bumper to Bumper	Spring-base	Width Over-all	V-12 Engine
Lincoln Custom	268H	Lim. 4400 lbs.	138"	230"	149"	77.62"	130 HP
Lincoln Continental	26H	Cab. 4020 lbs.	125"	217"	136"	77.82"	130 HP
Lincoln-Zephyr	26H	Sedan 3920 lbs.	125"	217"	136"	77.82"	130 HP

Mercury

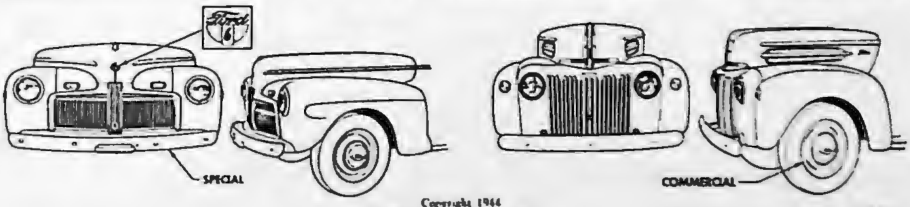


Model 29A
Engine V-8, 100 HP
Weight Town Sedan 3263 lbs. (approximate)
Wheelbase 118"
Length Bumper to Bumper 204.6"
Springbase 129.38" Width overall 73.12"

Ford



Type	Model	Engine	Approximate Weight	Wheelbase	Width Overall	Length Bumper to Bumper	Spring-base
Super Deluxe	21A	V-8, 90 HP	Fordor 3200 lbs.	114"	73.12"	199.65"	125.38"
Super Deluxe	2GA	6 Cyl., 90 HP	Fordor 3179 lbs.	114"	73.12"	199.65"	125.38"
Deluxe	21A	V-8, 90 HP	Fordor 3161 lbs.	114"	73.12"	196.90"	125.38"
Deluxe	2GA	6 Cyl., 90 HP	Fordor 3141 lbs.	114"	73.12"	196.90"	125.38"
Special	2GA	6 Cyl., 90 HP	Fordor 3093 lbs.	114"	73.12"	196.90"	125.38"
Commercial	29C	V-8, 100 HP	Pickup 2820 lbs.	114"		185.84"	
Commercial	21C	V-8, 90 HP	Pickup 2820 lbs.	114"		185.84"	123.13"
Commercial	2GC	6 Cyl., 90 HP	Pickup 2805 lbs.	114"		185.84"	123.13"
Commercial	2NC	4 Cyl., 40 HP	Pickup 2650 lbs.	114"		185.84"	123.13"



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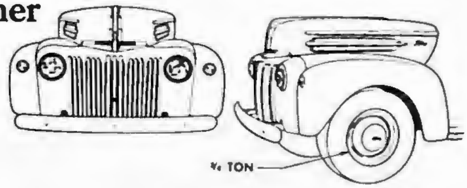
May 1, 1944

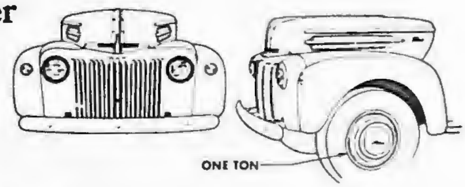
¾ Tonner

Models	Engine	Wheelbase	Approx. Weight Stake Body
21D	Ford V-8	122"	3489 lbs.
2GD	Ford 6 cyl.	122"	3467 lbs.
2ND	Ford 4 cyl.	122"	3329 lbs.
29D	Mercury V-8	122"	3489 lbs.



Tonner

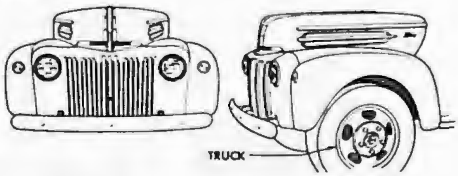
Model	Engine	Wheel-base	*Approx. Weight with Stake Body
29Y	Mercury V-8, 100 HP	122"	3650 lbs.
21Y	Ford V-8, 90 HP	122"	3650 lbs.
2GY	6 cyl., 90 HP	122"	3628 lbs.
2NY	4 cyl., 45 HP	122"	3475 lbs.



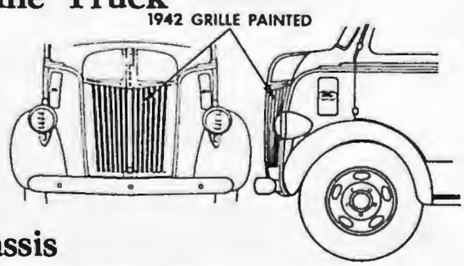
Regular Truck

Model and Engine			Wheel-base	*Approx. Weight With Stake Body		
V-8 Ford	V-8 Mercury	6 Cyl. Ford		V-8 Ford	V-8 Mercury	6 Cyl. Ford
21T	29T	2GT	134"	4516	4516	4452
218T	298T	2G8T	158"	4783	4783	4737
21U†	29U†	2GU†	134"	4964	4964	4842

†Dump Chassis.
‡With "WOOD" (Mfg.) dump body, closed cab and auxiliary springs.



Cab-Over-Engine Truck



Model and Engine		Wheel-base	*Approx. Weight With Chassis and Closed Cab	
V-8 Ford	V-8 Mercury		V-8 Ford	V-8 Mercury
211W	291W	101"	3584	3584
21W	29W	134"	3704	3704
218W	298W	158"	3734	3734

Bus Chassis

Model	Type	Wheelbase	Approximate Weight
29B	Rear Engine	148½"	4909
214T	School Bus	194"	3557
2G4T	School Bus	194"	3557
294T	School Bus	194"	3557

*Weights given for trucks with single rear wheels—standard springs.

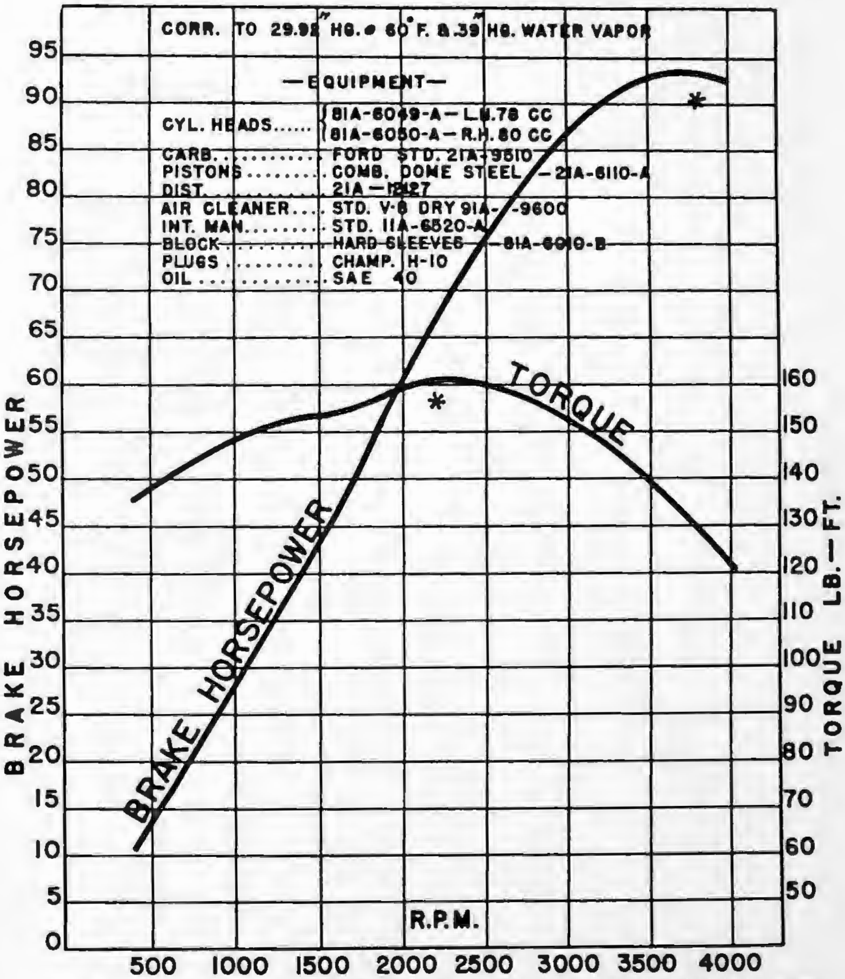
May 1, 1944

Printed in U.S.A.

SERVICE BULLETIN

PAGE NO. 33 SUBJECT NO. S-6000

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER.

*Advertised maximum torque and brake horsepower.

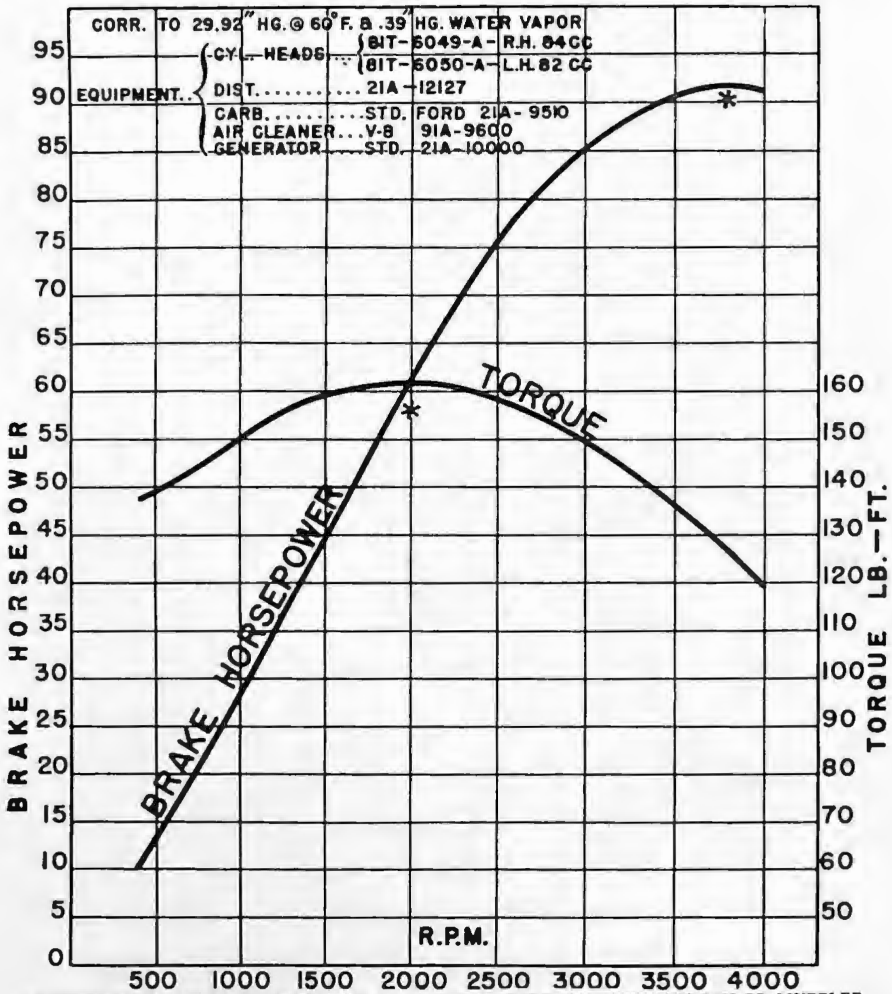
Figure 1

90 H. P. V-8 PASSENGER Starting 1941

Printed in U.S.A.

May 1, 1944

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER.

*Advertised maximum torque and brake horsepower.

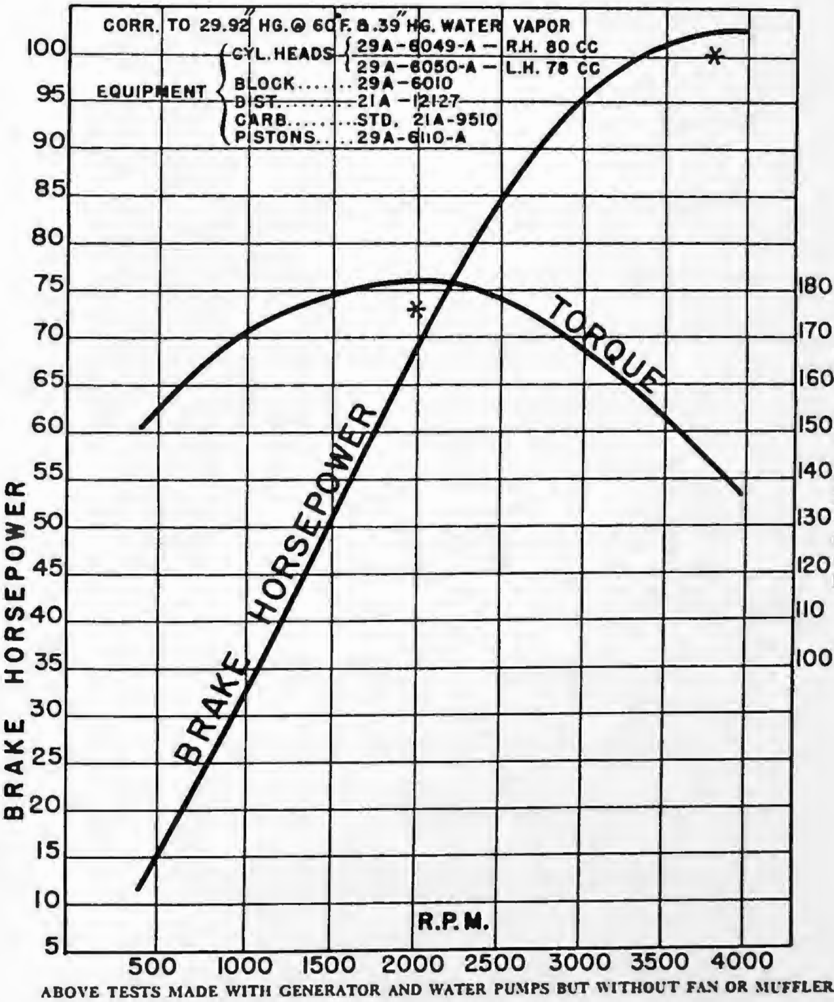
Figure 2

90 H. P. V-8 TRUCK Starting 1942

May 1, 1944

Printed in U.S.A.

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER.

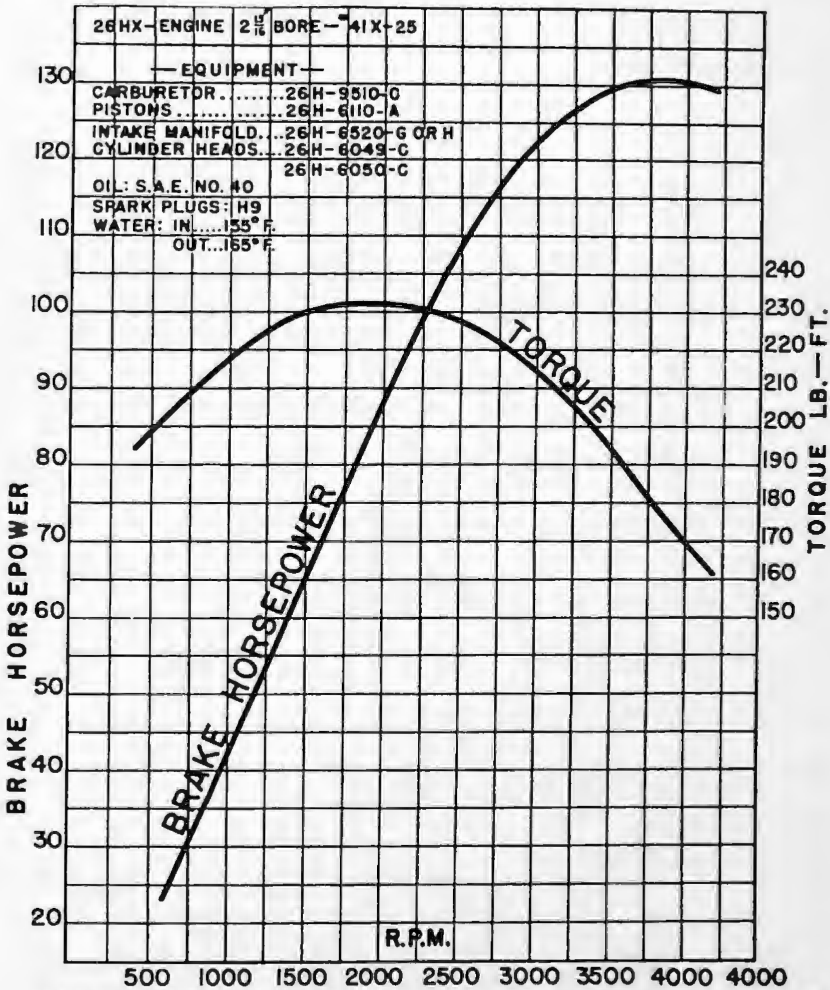
*Advertised maximum torque and brake horsepower

Figure 1

100 H. P. V-8 STARTING 1941

One mechanic can tighten a bolt as well as another. The greatest difference in mechanics lies in the degree of thoroughness with which they do their work and the logic they use in finding the underlying causes behind the failures they encounter.

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER.

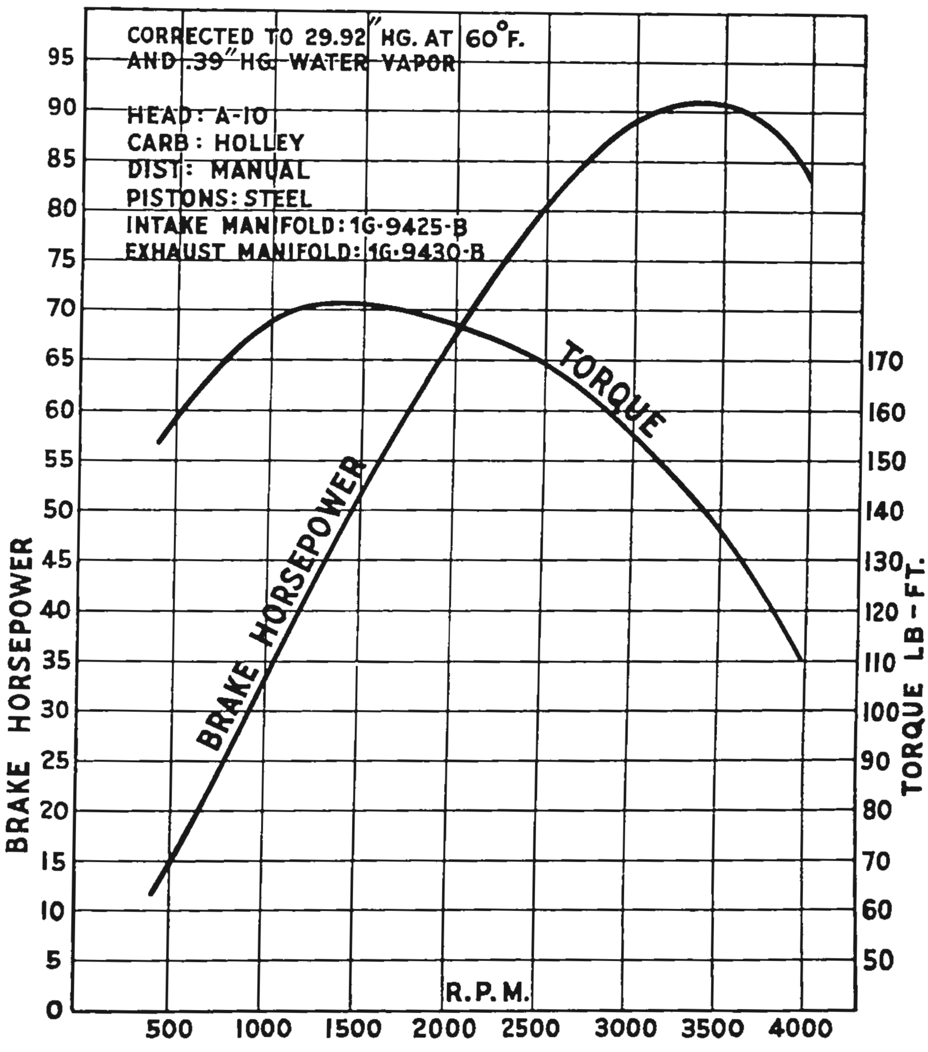
Figure 1

1942 LINCOLN

May 1, 1944

Mechanics should be ever alert to determine the cause behind any problem that they encounter. It is not enough to correct some immediate condition without searching for and correcting the underlying cause of the failure.

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER

Fig- 1

FORD 6 CYL. 1941

Printed in U.S.A.

May 20, 1941

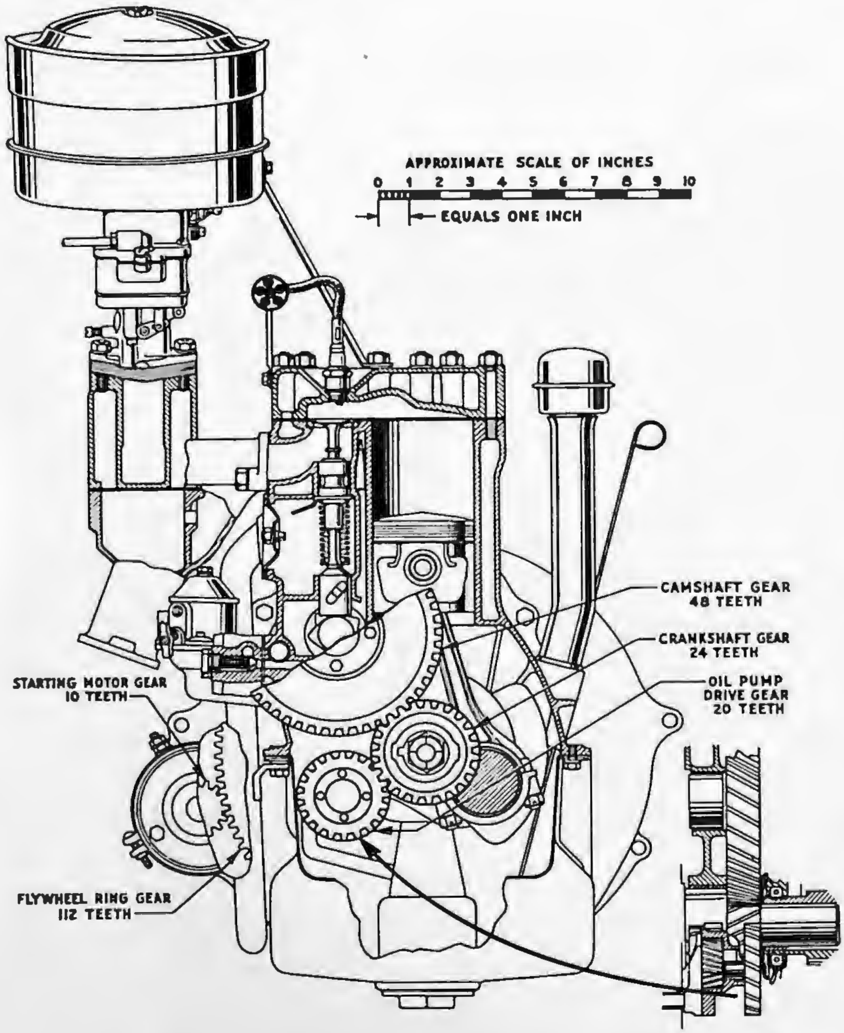
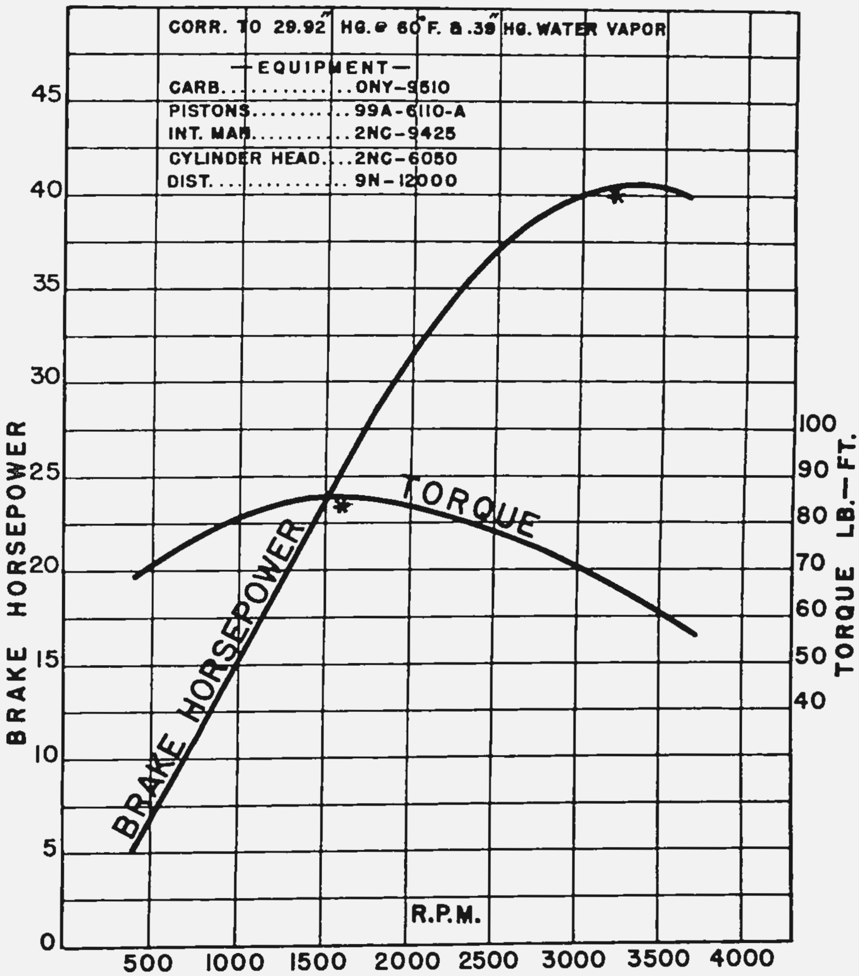


Fig. 2

6 CYL. STARTING 1941

May 20, 1941

Wide Open Throttle Engine Performance Curves



ABOVE TESTS MADE WITH GENERATOR AND WATER PUMPS BUT WITHOUT FAN OR MUFFLER.

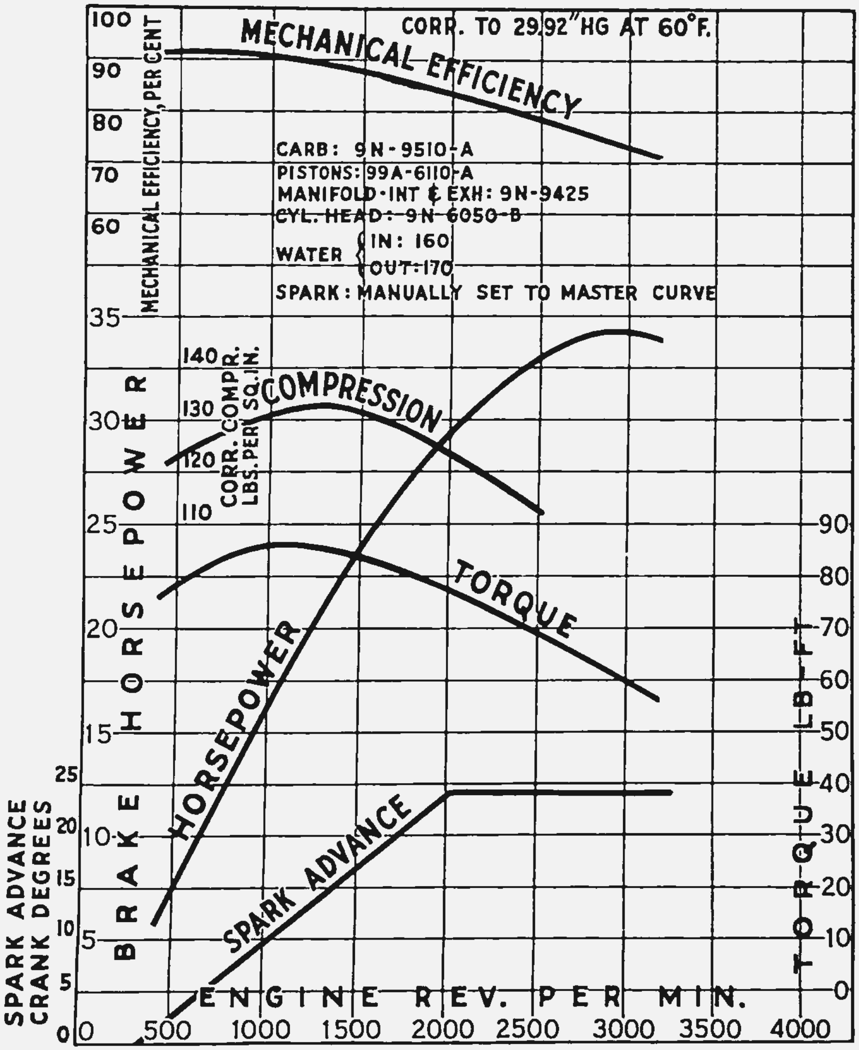
*Advertised maximum torque and brake horsepower.

Figure 1

4 CYL. 1942

Good service is quick service, for if the owner's loss of time offsets the value of good work performed, he is not getting good service.

Wide Open Throttle Engine Performance Curves



Above Tests Made with Generator and Water Pumps but without Fan or Muffler

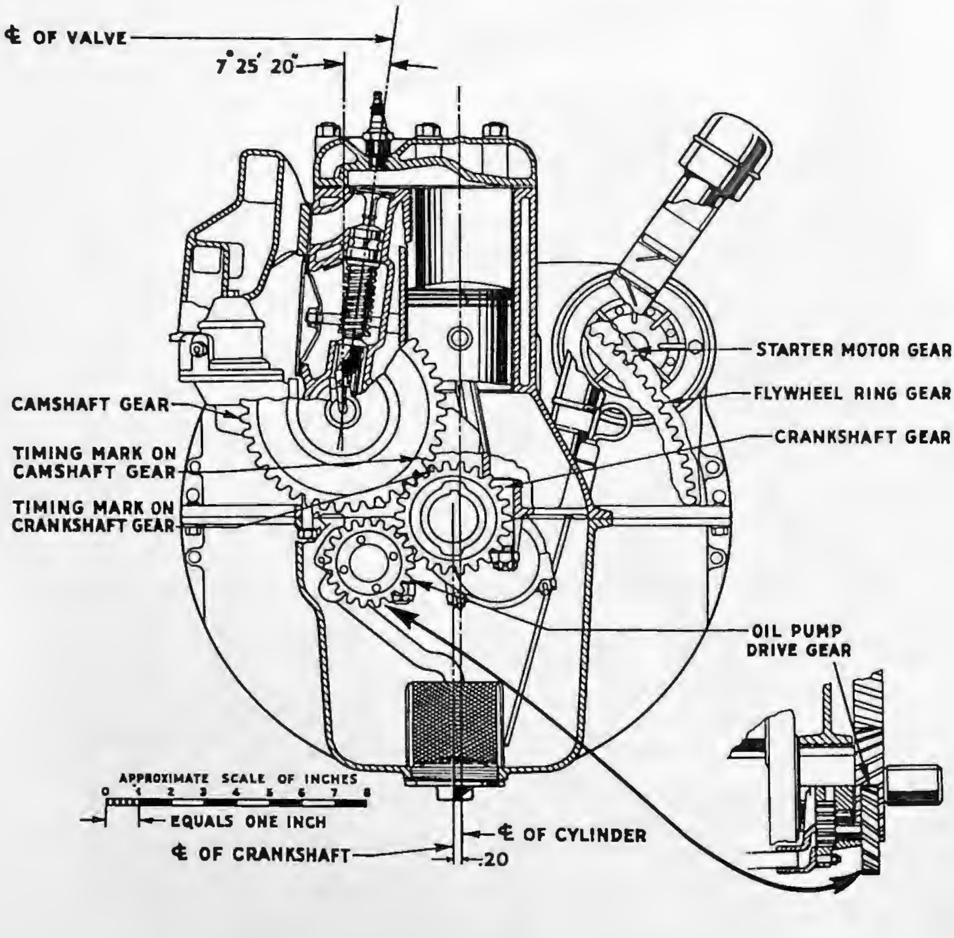
*Advertised maximum torque and brake horsepower.

Fig. 1

4 CYL. STARTING 1940

Printed in U.S.A.

April 1, 1941



1940 4-Cylinder Engine Typical Arrangement

Fig. 2

4 CYL. STARTING 1940

April 1, 1941

Printed in U.S.A.

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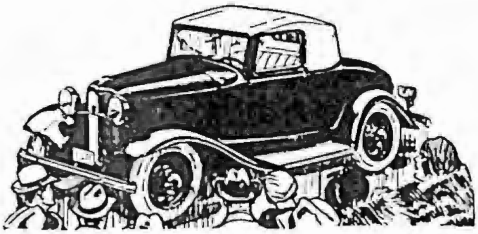
MORE HELP FOR THE VINTAGE V-8 ENTHUSIAST



FORD V-8 SERVICE BULLETINS 1932-1937 COMPLETE

It took off like the north wind, outfoxed all comers at corners, and outdistanced many costlier cars on every straight ribbon of road. Ford's V-8—revolutionary in the popular price field—secured an overnight reputation as the hottest mass-production car of its time.

This single volume assembles the complete series of Ford Service Bulletins—originally issued in periodic sections by the Factory as a primary reference for the Dealers—from the beginning of the V-8 lineage in 1932 through the close of 1937, when the run of the traditional monthly newsletters ended.

More than 750 photographs and line drawings document step-by-step, all-inclusive instructions—covering the car from top to toe board, from brake and steering adjustments to complete overhaul, from specification substitutions to radio installation.

As production spec. changes were cumulatively fixed in time and place by an irrevocable chronology, the Service Bulletins represent an unbroken frame of reference for detailed authentication among exacting Restorers.

Preservation of the original undistorted record is assured in this volume by a faithful reprinting of the six-year run of Service Bulletins in its full original form (model recognition illustrations and a master index have been added), page-by-page—from Page 1 through Page 488—to the inclusion of some data of comparative professional interest.

Legendary in its own time, the Ford V-8 could only have happened once. In addition to the Bulletins this book features exclusively, and in depth:

- The generally untold story of how the V-8 happened to come about. Determination, consuming Jealousy and vanadium-strong Will unfold in a fantastic study of contrasts—documented now for today's Restorer.
- The little-known Horatio Alger rise of the independent operator K. R. Wilson who became service-toolmaker-in-chief to the Ford Motor Company.
- Appearing also, in cameo form, is a complete reproduction of that originally large-format, leatherette-covered mechanical feature Showroom Presentation Catalog, well-remembered as a Ford sales floor "permanent fixture" in the days that followed that exciting announcement in the spring of 1932.

750 illustrations / 544 pages (5½ x 8½") indexed. Hardbound, foil-stamped, $12. postpaid.

FORD V-8 SERVICE BULLETINS 1938-1940 COMPLETE

By the late 1940's the Ford V-8 was fondly established among the young in heart from 16 to 60. Every looseleaf page published originally between 1938 and 1940 has been master-indexed and handsomely bound in this permanent new thumb-reference form for today's precision restorer. 1932-1937 coverage also appears through revisions issued during this period.

In the closing issue of the newsletter-style Bulletin (November-December 1937) future issues in a new form were announced with a heavy-duty, subject-tabbed binder offered to house an impending avalanche of subject-guided looseleaf sheets. Each page was dated and coded for section and folio.

By the close of 1940 the authorized dealer's binder had expanded to a thickness of 2" and a weight approaching eight pounds, containing more than 550 looseleaf pages issued since the revised system was inaugurated in 1938.

Complete data for 1938, 1939 and 1940 model years is encompassed, along with revisions of much material for models for 1932 to 1937.

Coverage extends to other Company cars, with substantial reference for the senior Lincoln, the Zephyr from its beginning for 1936 and Mercury from its start in 1939.

This faithful reproduction, reduced only in physical bulk for convenience, affords the restorer an undistorted technical look at these models.

The fountainhead value of this book to today's precision restorer can be immense.

750 illustrations / 576 pages (5½ x 8½") indexed. Hardbound, foil-stamped, $12. postpaid.

FORD, CLOSING THE YEARS OF TRADITION 1946-1948

A reference guide for the precision restorer reproducing in a single volume a rare selection of those source pieces which proved so fleeting in their original issue that few today have had access to this data — till now.

After three years of zero production during World War II, car makers discovered a car-hungry public in the summer of 1945, when they returned to the business of civilian demands. The necessity for immediate product was to preclude much novelty in that initial product.

In this classic seller's market the expedient solution throughout the motor industry was to put aside "all new" car plans and to offer familiar construction from that last year of production — 1942 — with simple face-lifts to add the element of the new.

Those postwar Fords in the time-proven mold — which were made up till the moment of that total departure for 1949 — represent a zenith in traditional Ford engineering design among those who revere the great Ford heritage. Surviving examples from this period are now stirring new interest. Restoration is the order of the day, with particular attention to authentic detail.

Fortunately for the collector, a substantial spread of primary reference was issued originally by the Ford Motor Company. Formidable sources of specification data were the Passenger Car Sales Handbook, for 1946 models, and the Passenger Car Data book, which supplemented it to cover minor points of revision for the 1947 and 1948 models.

Since these publications were furnished only to authorized dealers as sales tools, many reasonably regarded them as obsolete literature the day they were superceded. So it is that original copies have been hard to come by among today's enthusiasts.

This guide provides every Ford historian with a firm foundation by reproducing in full scale both the 1946 and the 1947-1948 information book rarities, as well as Fashionwise Accessories, the authorized extra equipment catalog, along with a host of obscure supporting pieces, including the radio manual, a brochure promoting the now-coveted Sedan Delivery, and even a tabulation from Branham listing starting and closing serial numbers for each model.

160 illustrations / 96 pages (8½ x 11"). Hard bound, printed-on cover, $8. postpaid.

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