SERVICE PROCEDURE
GM GENERAL MOTORS
CIVILIAN MOTOR TRANSPORTATION

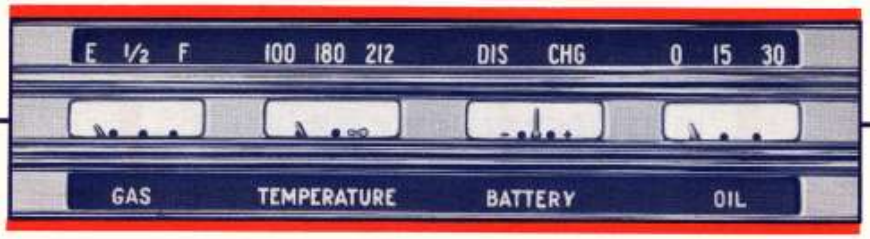
SHOP MANUAL

AC

HOW TO SERVICE
INSTRUMENTS

Ammeters
Water Temperature Gauges
Oil Pressure Gauges
Fuel Gauges

AC SPARK PLUG DIVISION, General Motors Corporation
FLINT, MICHIGAN

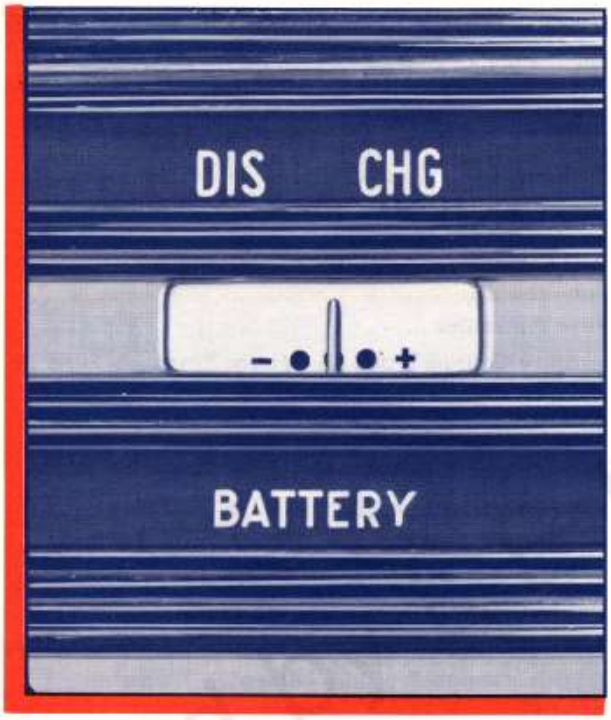


INSTRUMENTS

Ammeters...Fuel Gauges...Oil Pressure Gauges
Engine Temperature Gauges

Shop Manual Index

DIAGNOSING THE TROUBLE AMMETERS



Ammeter Troubles are of Four Kinds:

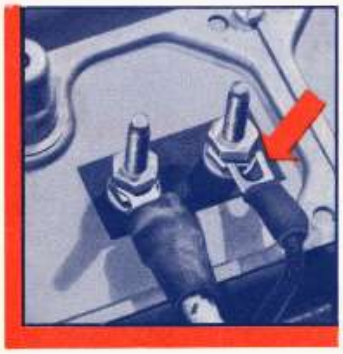
1. Pointer sticks against the dial and will not move.
2. Pointer moves in jerks, as though it is sticky.
3. The pointer does not point to zero or center mark when the ignition switch is turned off.
4. The pointer is "off calibration" (registers wrong).

LOCATING AMMETER TROUBLE

When the ammeter apparently fails to register correctly, there may be trouble in the wiring which connects the ammeter to the generator and battery, or in the generator or battery themselves.

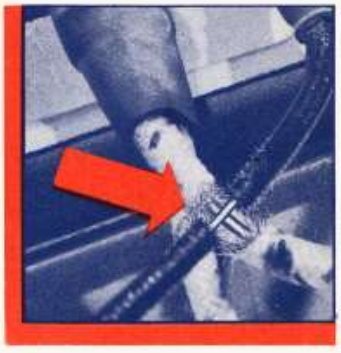
WARNING: **Always disconnect one of the cables from the battery before you touch any connections on any instrument. If you don't do this, you may burn out the ammeter and the other instruments.**

There are only a few simple things to check in order to find the cause:



1 Loose connections on the back of the ammeter (this is one of the most common troubles).

2 Loose connections at the back of the ignition switch, or at the battery (ammeters are not grounded to the panel).



3 Spots on the wiring where the insulation has been chafed, burned, or broken.

LOCATING AMMETER TROUBLE—(Continued)

To check the connections, first tighten the two binding posts on the back of the ammeter. Then, following each wire from the ammeter, tighten all connections on the ignition switch, battery, and generator.

Chafed, burned, or broken insulation can be found by following each ammeter wire from end to end.

CORRECTING AMMETER TROUBLE

All wires with chafed, burned, or broken insulation should be repaired or replaced. After this is done, and all connections are tightened, reconnect the battery cable and turn the ignition switch to the "on" position. The pointer should point to the negative (–) side slightly.

Start the engine and speed it up to an average speed. The pointer should then move to the positive (+) side, and its movement should be smooth.

If movement is smooth, but there is a question as to its accuracy, it should be checked in series with another ammeter, remembering that allowable calibration accuracy is plus or minus 10% of scale reading.

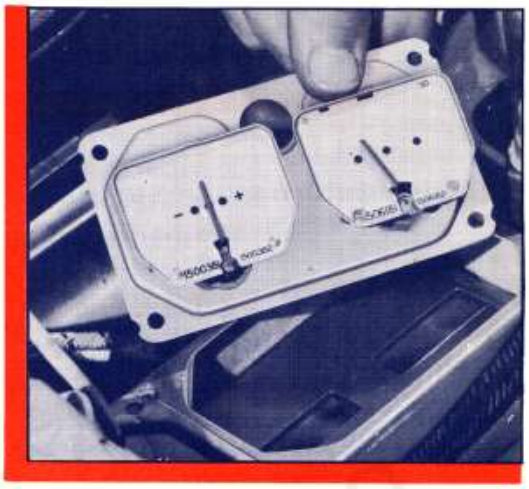
If the pointer does not behave correctly the ammeter itself is out of order and there is no way to fix it. Install a complete new ammeter. **Always replace with AC product only.**

Installing a New Ammeter

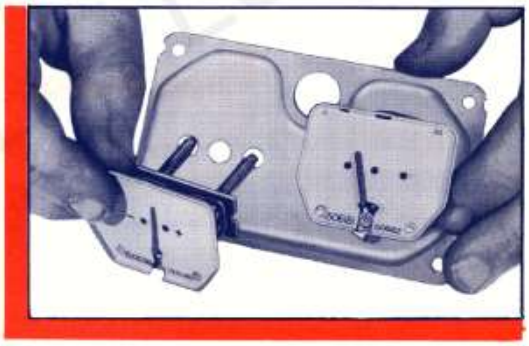
1 Disconnect one of the battery cables.

2 Disconnect the two wires attached to the "binding posts" at the back of the ammeter. Also remove the wires connected to any other instrument or light bulb which are fastened to the same back plate.

3 Loosen the screws or clamps which hold the ammeter to the back plate of the instrument panel.



4 Remove the back plate on which the ammeter is mounted.



5 Take off nuts on back of plate and remove ammeter unit.

6 Set the new ammeter in back plate, reinstall on the instrument panel, and reconnect the wires and battery cable.

SHORT CIRCUITS AND DISTORTED MECHANISMS WILL RESULT IF MOUNTING NUTS ON BACK OF ELECTRICAL INSTRUMENTS ARE TIGHTENED TOO MUCH.

WARNING! Be sure to mark one of the wires (such as tying a piece of string to it) so you will be able to tell which wire connects to which binding post of the new instrument. If you connect the wires to the wrong binding post, the ammeter will work backwards.

DIAGNOSING THE TROUBLE
TEMPERATURE GAUGES

AC temperature gauges are of two kinds. The vapor pressure type makes use of a sealed-in liquid, the expansion of which creates a pressure which moves the pointer on the gauge. The electrical type consists of an engine unit and a dash unit connected by a wire. The pointer is moved by changing the electrical value of two coils in the dash unit.

Vapor Pressure Type

Vapor pressure gauge troubles are of three kinds:

1. The pointer movement is sticky, jumpy, or uneven.
2. The pointer does not move at all.
3. The pointer shows temperatures which are obviously incorrect.

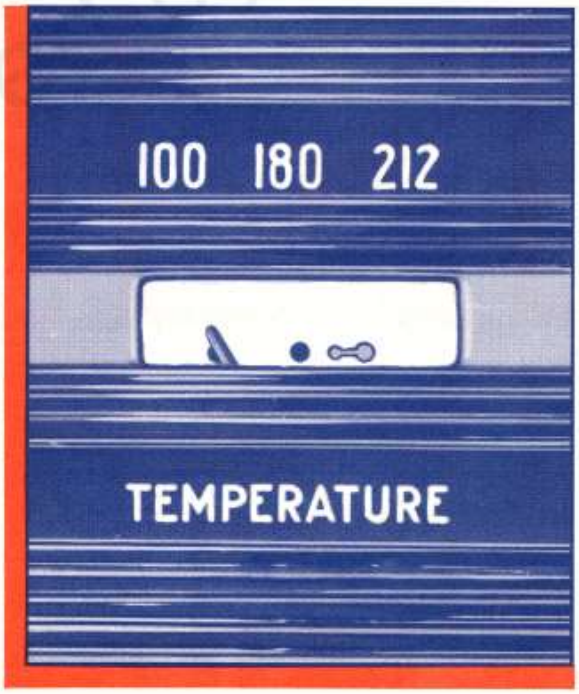
DIAGNOSING THE TROUBLE—TEMPERATURE GAUGES—(Continued)

Electrical Type

Electric temperature gauge troubles are of four kinds:

1. The pointer doesn't move when the ignition switch is turned "on."
2. The pointer indicates a high temperature (with the ignition switch turned "on") whether the engine is hot or cold.
3. The pointer does not show temperature accurately.
4. The pointer indicates a low temperature (with the ignition switch turned "on") whether the engine is hot or cold.

In addition to the above, any of the engine troubles as shown on page 10 under vapor pressure gauges can also affect the electrical unit.



LOCATING THE TROUBLE

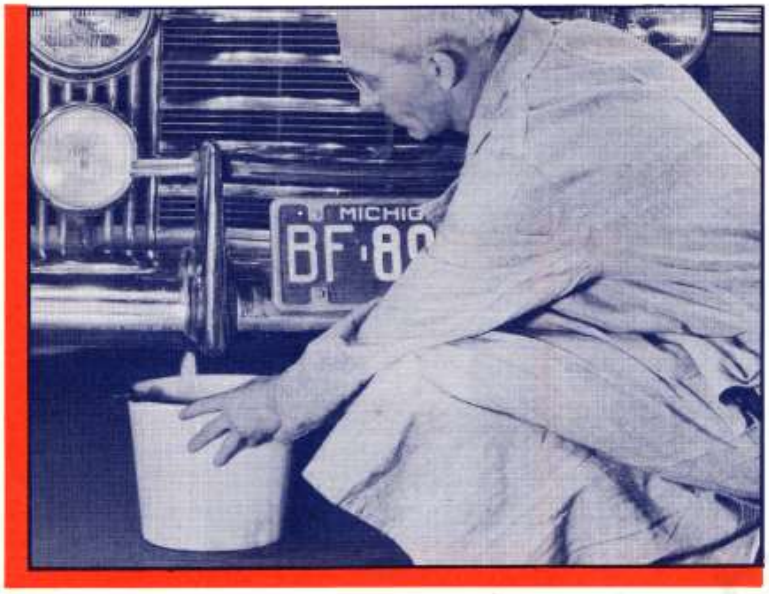
Vapor Pressure Temperature Gauges

Most automotive engines are designed to operate at temperatures between 150 and 180 degrees. Should the gauge read consistently higher than normal operating temperatures, the engine may be overheating, and the cause may be one or more of the following things:

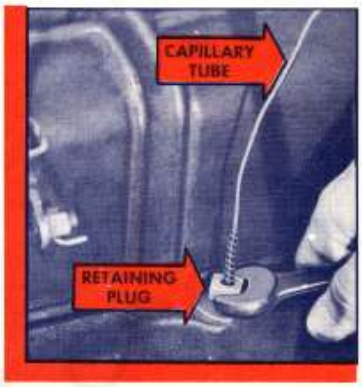
Broken or loose fan belt.	Thermostat out of order.
Collapsed radiator hose.	Radiator pressure cap not operating properly.
Frozen radiator.	Poor engine lubrication.
Obstruction in the front of the radiator, such as a large number of insects, or dirt.	Low water level in the radiator and cooling system.

After you check all of these possible engine troubles, test the temperature gauge to make sure that nothing is wrong with it. This is easy to do:

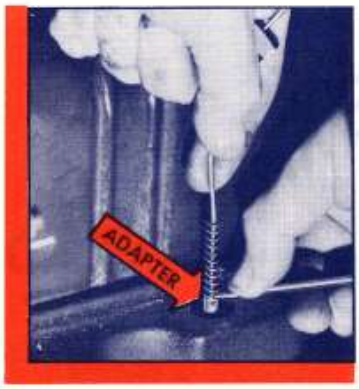
Vapor Pressure Type Temperature Gauges



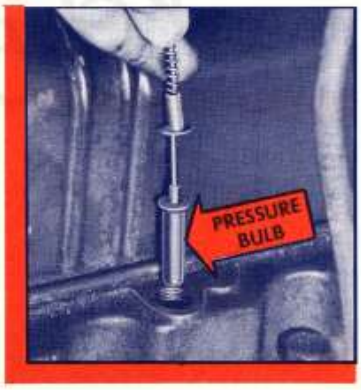
1 Drain water from the radiator.



2 Loosen plug which holds the vapor pressure bulb in the engine block.



3 Pry loose the adapter which seats on the bulb. Do not pull up on the tube until adapter and bulb are free, as this may damage capillary tube and bulb.



4 Remove the vapor pressure bulb from the engine block.

5 Put the vapor pressure bulb in a pail of hot water. Also place a thermometer which reads up to 200° F., or higher, and which is reasonably accurate in the hot water. Leave them about three minutes.

If the temperature gauge is okay, the pointer should register the same temperature as the thermometer.

If this test shows that the trouble is in the temperature gauge itself, there is nothing to fix. The entire gauge should be replaced with a new unit. **Always replace with AC product only.**

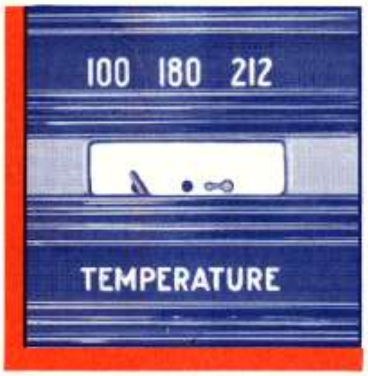
Electrical Type Temperature Gauges

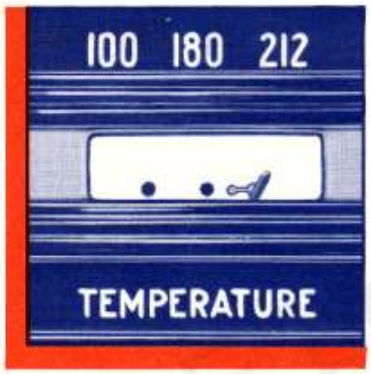
Incorrect temperature readings are checked as follows:

1 Disconnect the wire from the binding post on the end of the engine unit.

2 Turn ignition switch "on."

3 Hold the end of the wire away from all wires, or other metal.





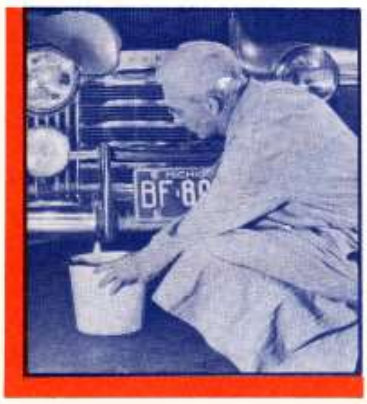
4 Check the dash unit. The needle should point to "100" or the **low** mark.

5 Touch the bare end of the wire to the engine block.

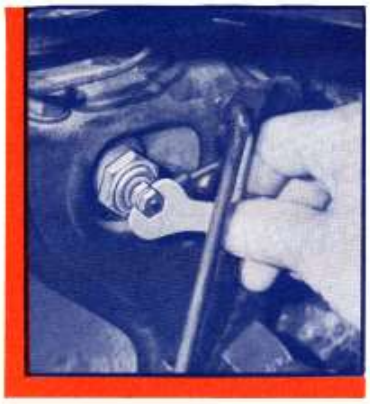
6 Check the dash unit again. The needle should then point to over "212," or the **high** mark.

7 If the dash unit reads as described in 4 and 6 above, it indicates reasonable performance of the dash unit and the connecting wire. In this event, the engine unit should be checked as described below.

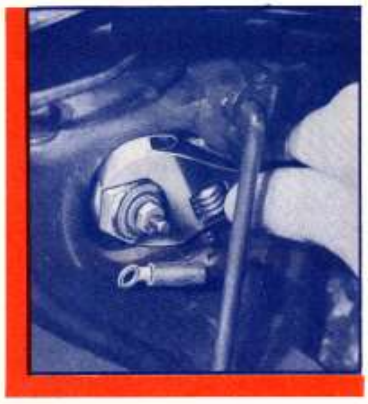
If the dash unit does not indicate properly, then first check the wire. If it is sound, then replace the dash unit. **Always replace with AC product only.**



8 Drain water from the radiator. Do not throw this water away—it may contain antifreeze.

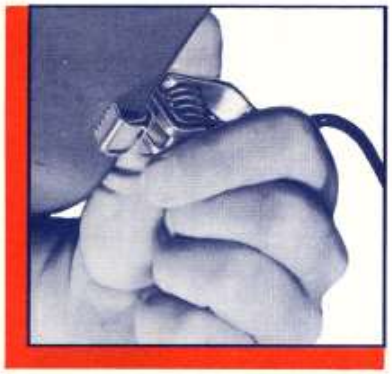


9 Disconnect the wire which is attached to the unit in the engine block.



10 Loosen engine unit. Unscrew the unit from the engine block and lift it out.

11 Reconnect lead wire to engine unit. Ground threaded portion to convenient point on car with suitable wire and clamps.



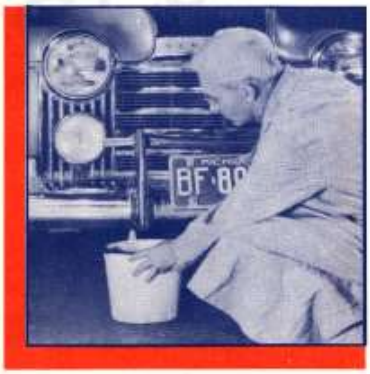
WARNING! Put the threaded end of the engine unit in the water — and DO NOT LET ANY WATER GET ABOVE THE THREADS! If you do, you may ruin the unit.

If the temperature gauge is okay, the pointer should register the same temperature as the thermometer. If the pointer does not register correctly, replace the engine gauge with a new unit. Always replace with AC product only.

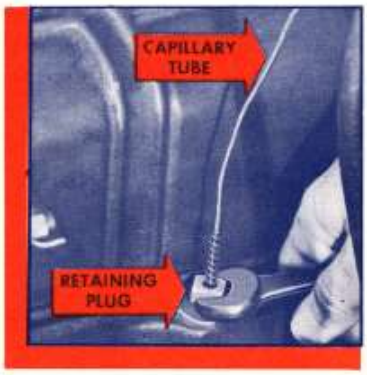
12 Get a pan or can of hot water and a thermometer reading 200° or slightly higher which you know is reasonably accurate. Put the threaded end of engine unit **PART WAY** down into the hot water. Put the thermometer in also. Leave them about three minutes.

CORRECTING THE TROUBLE

Installing New Vapor Pressure Temperature Gauge

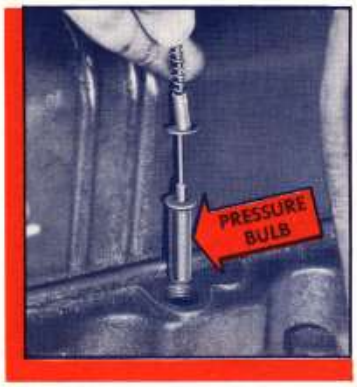


1 Drain about a pail of water from the radiator. (The drain cock is usually located under the hood, at the bottom of the radiator.) Do not throw this water away — it may contain anti-freeze and can be put back after the new temperature gauge is installed.

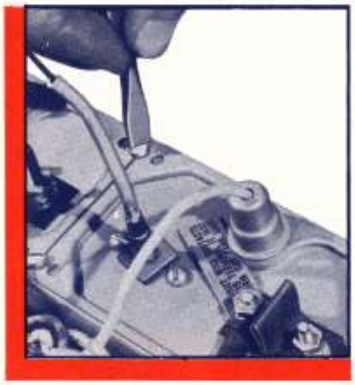


2 Unscrew the plug holding the vapor bulb in the engine block. This can be found easily by following the capillary tube from the panel unit to the engine unit.

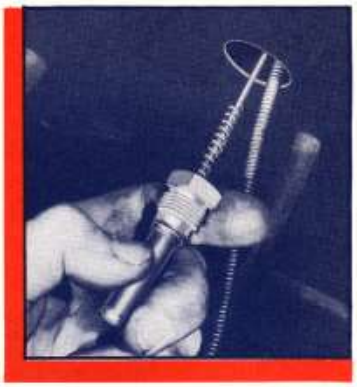
3 Pry loose the adapter which seats on the vapor bulb. Do not pull up on the tube until adapter and bulb are free, as this may damage capillary tube and vapor bulb.



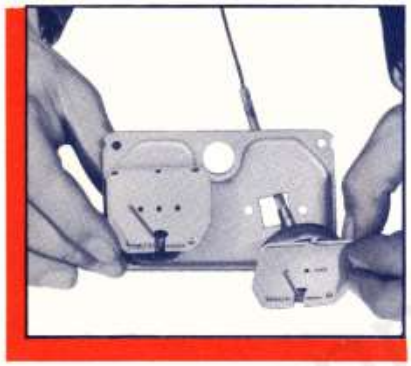
4 Remove the vapor bulb from the engine block.



5 Loosen the screws or clamps which hold the temperature gauge back plate to the instrument panel. Also disconnect any other instrument or light bulbs from back plate.



6 Push the capillary tube and vapor pressure bulb through the hole in the dash.



7 Loosen the two screws on the back plate and pull capillary tube and vapor bulb through the hole in back plate. Discard the complete temperature gauge, and replace with new unit. **Always replace with AC product only.**

8 Push the vapor bulb of the new temperature gauge through the back plate of the instrument panel and then through the hole in the dash **from the driver's side.** Replace the rubber grommet.

9 Insert new vapor pressure bulb and adapter in engine block and tighten plug. **Always replace with AC product only.**

WARNING! Don't use a wrench with too long a handle, and don't turn the bulb down too hard. A water-tight fit is all that is needed.

10 Fasten the new temperature gauge indicating unit to back plate of instrument panel. Then fasten back plate to panel and reconnect all wires to other gauges or light bulbs. Be sure to refill radiator with liquid that was drained from it. **NOTE: Never replace an AC product with another make. It won't work.**

Electrical Type Temperature Gauges

Open (broken) and short circuits are repaired in one of the following ways:

If it is a broken wire, replace it with a new one. (If a new wire is not available, peel off the insulation for about ½ inch on both broken ends, twist the bare wire tightly together and solder it, cover the soldered joint thoroughly with friction tape.)

If it is a loose connection, carefully clean the end of the wire and the binding post and tighten the connection securely.

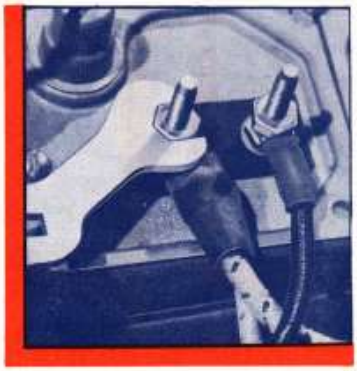
If it is a break at the end of the wire, where the flat loop or terminal is attached to the wire, install a complete new wire. (If a new wire is not available, clean off the broken end and resolder to terminal.)

If it is a "short circuit," look for a spot where the insulation has been chafed, burned, or torn away from the wire and cover it thoroughly with friction tape.

Repairs You CAN'T Make. For all other troubles, install a new unit. The test on pages 11 and 12 will tell you which unit needs replacing. **Always replace with AC product only.** It should be noted that it is seldom necessary to replace both dash and engine unit to correct trouble.

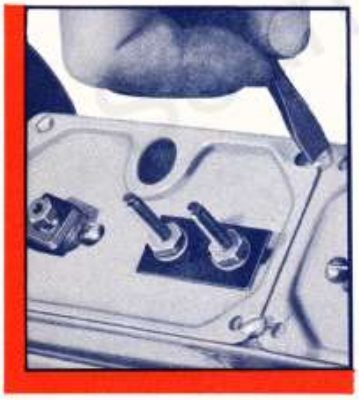
Installing New Electrical Gauge on Instrument Panel

1 Disconnect one of the two battery cables.

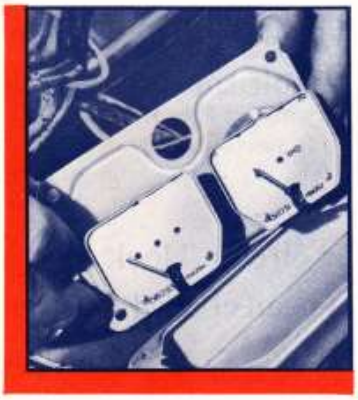


2 Disconnect the two wires attached to the "binding posts" at the back of the temperature gauge.

WARNING! Be sure to mark one of the wires behind the gauge (such as tying a piece of string to it) so you will be able to tell which wire connects to which binding post of the new instrument. If you connect the wires to the wrong binding post, the gauge will not indicate properly.



3 Loosen the screws or clamps which hold the temperature gauge back plate to the instrument panel.

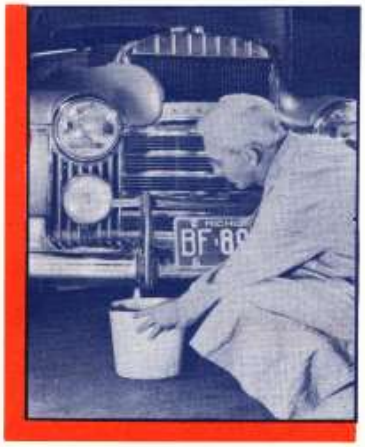


4 Remove the back plate on which the gauge is mounted.

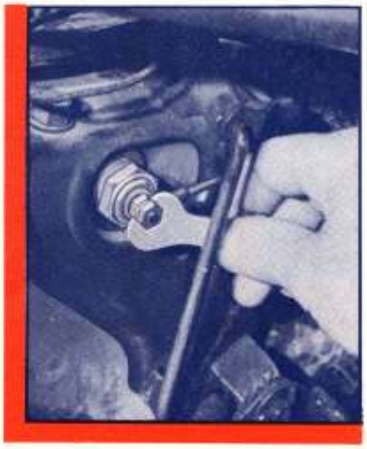
5 Take off the nuts on the back of this plate and remove the temperature gauge indicating unit.

6 Set the new gauge in back plate, reinstall on the instrument panel. Reconnect the wires to the correct binding posts. Also reconnect battery cable. Tighten all connections securely. **NOTE: Never replace an AC product with another make. It won't work!**

Installing New Unit in Engine Block



1 Drain about ¾ of a pail of water from the radiator. (The drain cock is usually located under the hood, at the bottom of the radiator.) Do not throw this water away — it may contain anti-freeze, and it can be used again.



2 Disconnect the wire attached to the top of the engine block unit. (You can locate this unit by following the wire which runs from the gauge on the instrument panel.)

3 Loosen the unit in the engine block. Lift out engine block unit.

4 Screw the new unit into engine block hole, and tighten securely. (Do not use pipe thread compound on threads.) **NOTE: Never replace an AC product with another make. It won't work!**

WARNING! Don't use a wrench with too long a handle, and don't turn the unit down too hard. A water-tight fit is all that is needed.

5 Reconnect wire to engine unit.

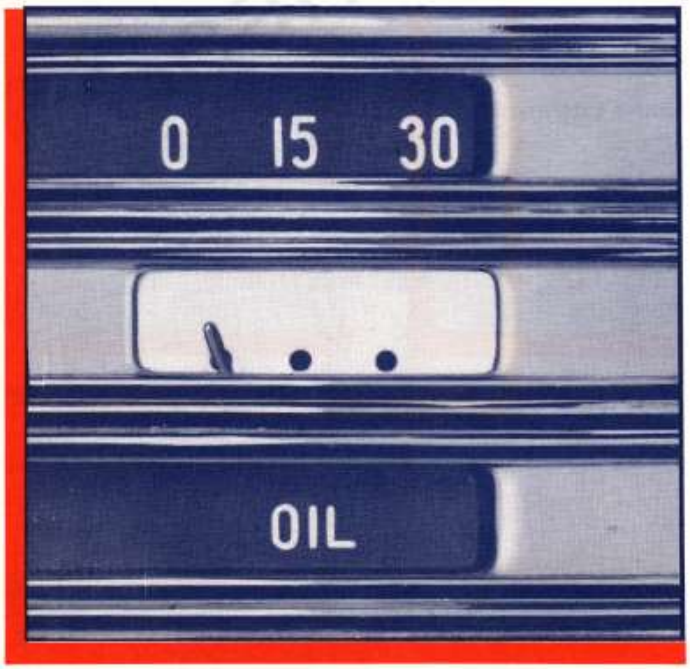
6 Be sure to refill the radiator with the liquid originally drained out.

DIAGNOSING THE TROUBLE OIL PRESSURE GAUGES

AC oil pressure gauges are of two kinds. The pressure expansion type makes use of pressure developed by the oil pump acting directly on the mechanism of the gauge on the instrument panel. The electrical type consists of an engine unit and a dash unit connected by a single wire. The pointer is moved by changing the electrical value of two coils in the dash unit.

Pressure Expansion Type

Oil pressure gauges of the expansion type are subject to two kinds of trouble:



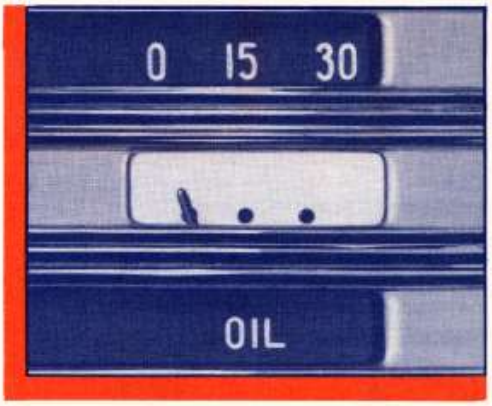
1 The gauge on the instrument panel shows a very low pressure at normal engine speed and temperature.

2 The pointer is jumpy, sticky, or uneven in its movement.

DIAGNOSING THE TROUBLE— OIL PRESSURE GAUGES—(Continued)

Electrical Type

AC electrical oil pressure gauges are made up of two units — the gauge on the instrument panel and the unit mounted in the engine. Wiring connects the two.



Oil Pressure Gauge—Electrical Resistance Type

Electrical oil pressure gauges are subject to five kinds of trouble:

1 Pointer will not move when the ignition switch is turned "on."

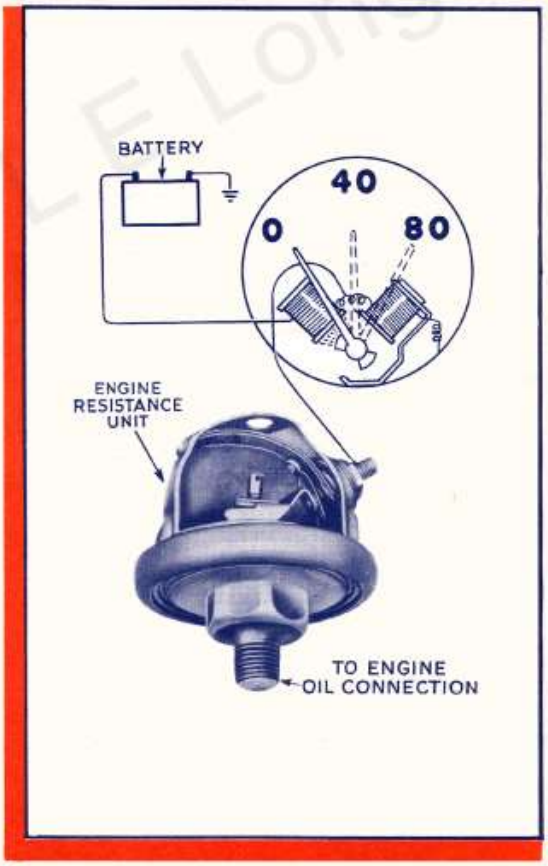
2 The pointer registers a high pressure under all conditions.

3 The pointer stays at "0" under all conditions.

4 The pointer never drops to "0" or always registers too high a pressure.

5 The pointer always registers too low a pressure.

See pages 21-23 for method of locating trouble in dash or engine units, or wiring.



Electric Oil Gauge Dash and Engine Unit Wiring Diagram

LOCATING OIL PRESSURE GAUGE TROUBLE

Engine "Idling"

At Driving Speed

Pressure Expansion Type

When the engine is "idling" (running while the car or truck is standing still), the oil pressure gauge may point to between 3 and 15 pounds, depending on the make of car. When the engine is running at a speed equal to a car speed of about 30 miles an hour, the gauge should show between ½ and ¾ total.

If the pointer on the gauge is sticky, jumpy, or uneven in its movement, you cannot fix it. A new gauge should be installed. **Always replace with an AC product only.**

If it is suspected that the gauge is off calibration, another gauge can be attached to the oil line for check.

LOCATING OIL PRESSURE GAUGE TROUBLE—(Continued)

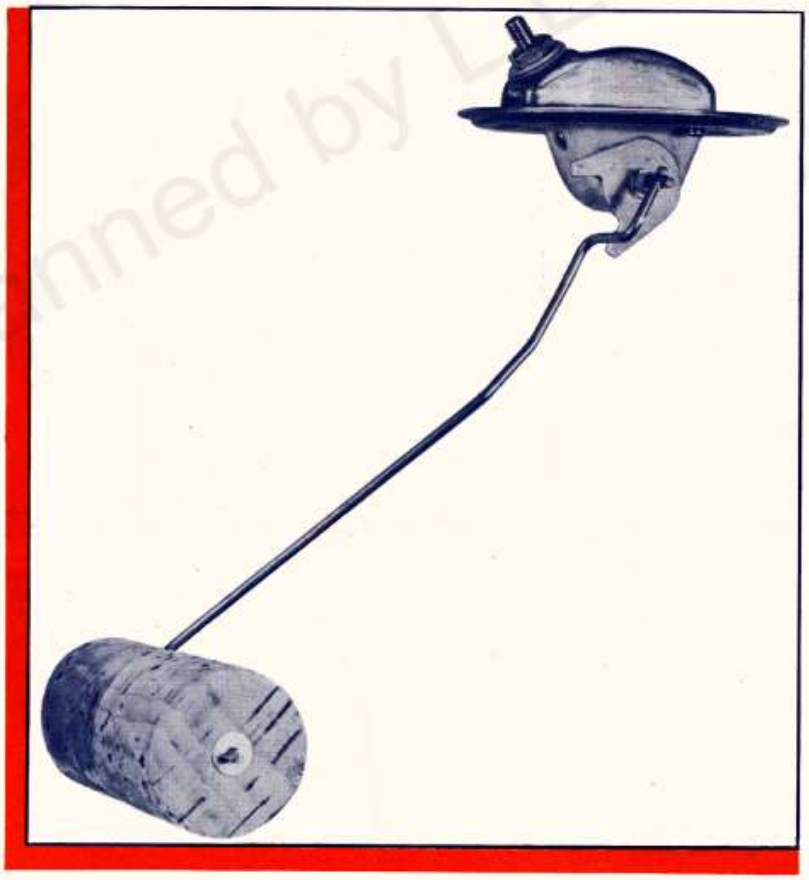
Electrical Type

The first thing to do is to find out whether the trouble is in the panel instrument, the wiring, or the engine unit. Here is how to go about it:

FIRST — Make yourself a tester. This is very simple:

Get an AC fuel gauge tank unit or obtain an AC Gas Gauge Tester (1516000) from your local jobber. This is the one with the long, movable arm with a cork float on the end. Attach a spring terminal clip to a 5-foot piece of colored insulated wire, and connect the other end of this wire to the binding post of the tank unit.

Next, attach two spring terminal clips to a similar piece of black insulated wire. Your tester is now ready for use.



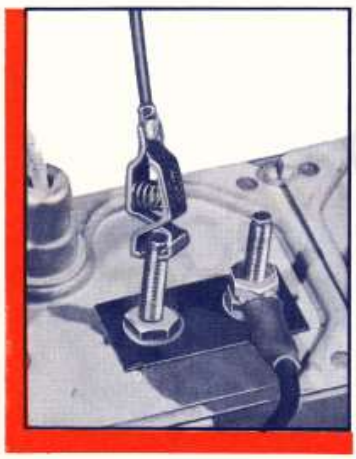
LOCATING OIL PRESSURE GAUGE TROUBLE—ELECTRICAL TYPE—(Continued)

To test the panel instrument, proceed as follows:

1 Turn the ignition switch "off."

2 Disconnect one of the battery cables.

3 Disconnect the wire from the oil gauge mounted on the instrument panel. **This is the wire which leads to the engine unit.**



4 Using the spring clip, connect your colored tester wire to the binding post from which you removed the wire.

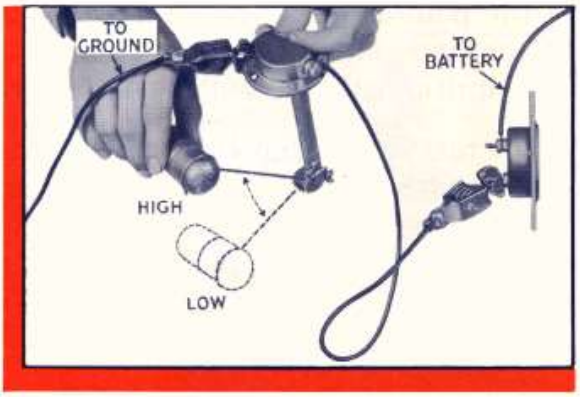
5 Connect the other wire (BLACK) to the flange of the tester and to any convenient "ground" — such as the unpainted part of the instrument panel.

6 Turn the ignition switch "on."

WARNING! Be very careful to connect the tester wires in exactly this way. If you connect the wire to the wrong binding post, you will burn out the tester.

LOCATING OIL PRESSURE GAUGE TROUBLE—ELECTRICAL TYPE—*(Continued)*

7 Connect the battery cable. Move the arm of your tester back and forth slowly. If the panel instrument is okay, the pointer will move from the low mark to the high mark freely. If the pointer doesn't move, then you have found your trouble, and a new panel instrument should be installed. **Always replace with AC product only.**



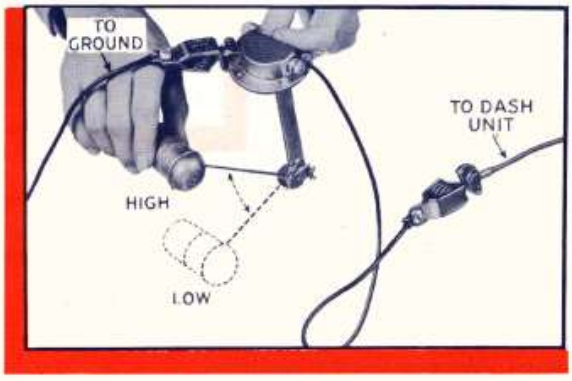
If the panel instrument proves to be okay, the next step is to test the wiring between the panel and the engine unit. You can use your tester for this also.

Here is how:

1 Turn the ignition switch "off" and disconnect one battery cable.

2 Follow the wire from the dash unit to the engine unit. Disconnect the wire at engine unit.

3 Attach your COLORED tester wire to the end of the wire which runs up to the instrument panel. Attach the BLACK wire to any convenient ground, such as an unpainted part of the engine.



4 Connect the battery cable. Move the arm of your tester back and forth. If the wiring is okay, the pointer on the instrument will move from the low mark to the high mark freely. If the pointer doesn't move, or only moves part way, you have found that the trouble is in the wire from the instrument to the engine unit and the wire should be repaired or replaced.

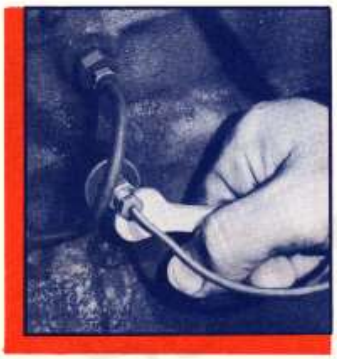
LOCATING OIL PRESSURE GAUGE TROUBLE—ELECTRICAL TYPE—(Continued)

If the pointer **does** move correctly, then you know that the trouble is at the engine unit. If the connection at the engine unit is clean, then a new engine unit must be installed. **Always replace with AC product only.**

If the test shows that the trouble is not in the gauge itself, you can easily repair wiring troubles. (See page 15.) Gauge troubles can be remedied only by installing a new instrument panel gauge or a new unit in the engine block. **Always replace with AC product only.** See page 25 for instructions.

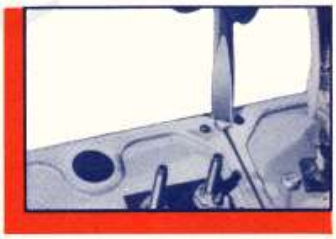
CORRECTING OIL PRESSURE GAUGE TROUBLE

Installing New Pressure Gauge

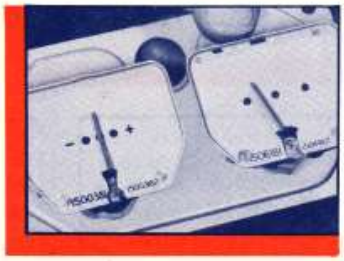


1 Check oil line which leads from instrument panel to engine for oil leaks. Loosen oil line at engine block, while engine is running. If oil runs out, it indicates that the trouble is either in oil line or panel instrument.

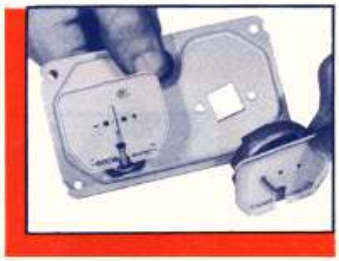
2 With the engine shut off, disconnect the oil tube at the back of the oil pressure gauge in the back of the instrument panel.



3 Loosen the screws or clamps which hold the back plate to the instrument panel.



4 Remove the back plate on which the gauge is mounted.



5 Take off the two screws which hold the gauge to the back plate. Then remove the gauge itself.

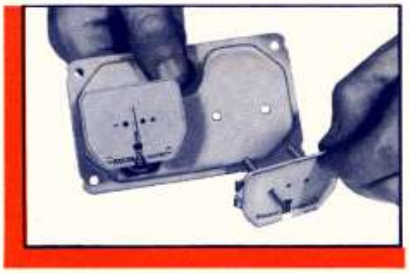
6 Set the new gauge in back plate, and reinstall on instrument panel. Reconnect the oil tube and tighten securely.

Installing New Electrical Gauge on Instrument Panel

1 Disconnect one of the two battery cables.

2 Disconnect the two wires attached to the "binding posts" at the back of the electric oil gauge.

3 Loosen the screws or clamps which hold the electric oil gauge back plate to the instrument panel.



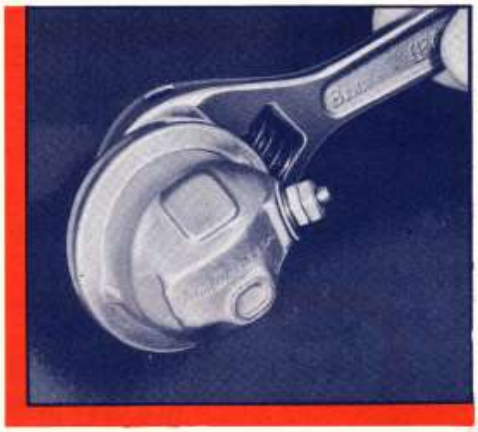
4 Take off the two screws which hold the gauge to the back plate; then lift the gauge away.

5 Set the new gauge in position, tighten the clamps, reconnect the wires, and reconnect the battery cable. Tighten securely. **NOTE: Never replace an AC product with another make. It won't work!**

WARNING! Be sure to mark one of the wires behind the gauge (such as tying a piece of string to it) so you will be able to tell which wire connects to which binding post of the new instrument. If you connect the wires to the wrong binding post, the gauge will not indicate properly.

Installing New Unit in Engine Block

1 Disconnect the wire attached to the top of the engine block unit. (You can locate this unit by following the wire which runs from the gauge on the instrument panel.)



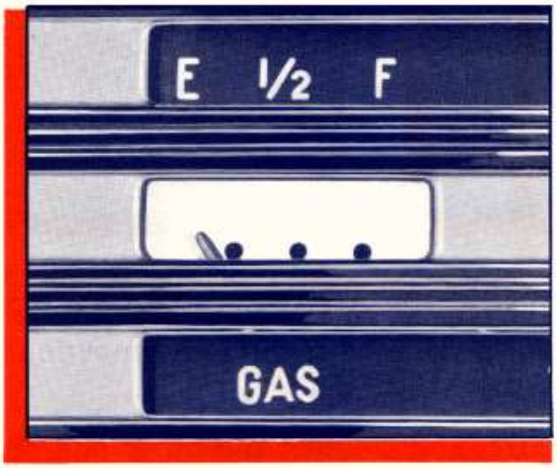
2 Unscrew the unit from the engine block, and lift it out.

3 Screw the new unit into this hole, and tighten securely. **NOTE: Never replace an AC product with another make. It will not work!**

4 Reconnect wire to engine unit.

WARNING! Don't use a wrench with too long a handle, and don't turn the unit down too hard. An oil-tight fit is all that is needed.

DIAGNOSING THE TROUBLE
FUEL (GASOLINE) GAUGES



Electric Fuel Gauge Indicator

Electric Fuel Gauge Tank Unit

AC fuel gauges consist of two units—the gauge on the instrument panel and the unit mounted in the fuel tank. Wiring connects the two. The pointer is moved by changing the electrical value of the two coils in the dash unit.

Fuel gauge troubles are of the following kinds:

1. The pointer does not move when the ignition switch is "on."
2. The pointer registers "full" all the time.
3. The pointer registers "empty" all the time.
4. The pointer never registers "empty" and is always too high.
5. The pointer never registers "full" and is always too low.

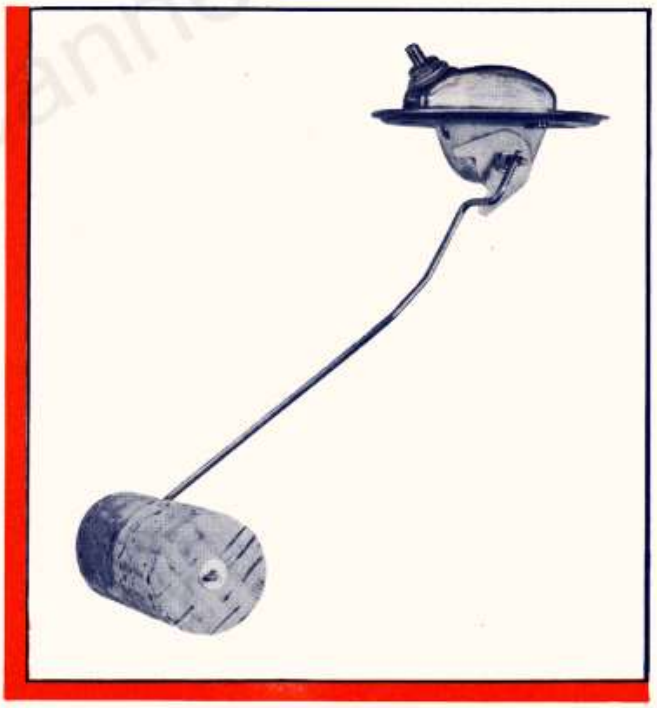
LOCATING FUEL (GASOLINE) GAUGE TROUBLE

The first thing to do is to find out whether the trouble is in the panel instrument, the wiring, or the tank unit. Here is how to go about it:

FIRST—Make yourself a tester. This is very simple.

Get an AC fuel gauge tank unit or obtain an AC Gas Gauge Tester (1516000) from your local jobber. This is the one with the long, movable arm with a float on the end. Attach a spring terminal clip (see illustration) to a 5-foot piece of colored insulated wire, and connect the other end of this wire to the binding post of the tank unit.

Next, attach two spring terminal clips to a similar piece of black insulated wire. Your tester is now ready for use.



LOCATING FUEL (GASOLINE) GAUGE TROUBLE—(Continued)

To test the panel instrument, proceed as follows:

1 Turn the ignition switch "off."

2 Disconnect one of the battery cables.

3 Disconnect the wire from the fuel gauge mounted on the instrument panel. **This is the wire which leads to the tank unit.**

4 Using the spring clip, connect your colored tester wire to the binding post from which you removed the wire.

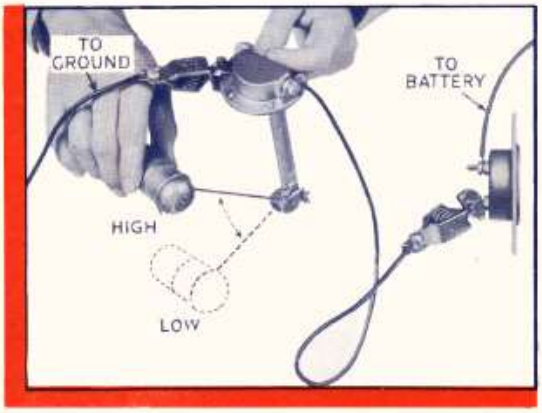
5 Connect the other wire (BLACK) to the flange of the tester and to any convenient "ground" — such as the unpainted part of the instrument panel.

6 Turn the ignition switch "on."

WARNING! Be very careful to connect the tester wires in exactly this way. If you connect the wire to the wrong binding post, you will burn out the tester.

LOCATING FUEL (GASOLINE) GAUGE TROUBLE—(Continued)

7 Connect the battery cable. Move the arm of your tester back and forth slowly. If the panel instrument is okay, the pointer will move from "Empty" to "Full" freely. If the pointer doesn't move, or only moves part way, then you have found your trouble, and a new panel instrument should be installed. **Always replace with AC product only.**



If the panel instrument proves to be okay, the next step is to test the wiring between the panel and the fuel tank. You can use your tester for this also.

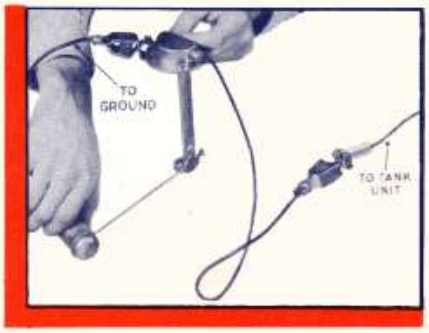
Here is how:

1 Turn the ignition switch "off."

2 Follow the wire from the tank unit to the "bayonet connection" or the terminal junction block. Disconnect the wire at this point.

3 Attach your COLORED tester wire to the end of the wire which runs up to the instrument panel. Attach the BLACK wire to the car frame for a ground.

4 Connect the battery cable and turn the ignition switch on. Move the arm of your tester back and forth. If the wiring is okay, the pointer on the instrument will move from "Empty" to "Full" freely. If the pointer doesn't move or only moves part way, you have found that the trouble is in the wire from the instrument to the tank.



LOCATING FUEL (GASOLINE) GAUGE TROUBLE—(Continued)

If the pointer **does** move correctly, then you know that the trouble is in the tank unit, or the wire which runs from it to the "bayonet connection" or terminal junction block. If the connections are all clean and tight, and there are no breaks or chafes in the wire from the bayonet connection to the tank, then a new tank unit must be installed. **Always replace with AC product only.**

CORRECTING FUEL (GASOLINE) GAUGE TROUBLE

Repairs That You Can Make

If it is a broken wire, replace it with a new one. (If a new wire is not available, peel off the insulation for about ½ inch on both broken ends, twist the bare wire tightly together and solder it, cover the soldered joint thoroughly with friction tape.)

If it is a poor, or loose, connection, carefully clean the end of the wire and the binding post and tighten the connection securely.

If it is a "grounded" binding post on the tank unit, thoroughly clean the connection and tighten it.

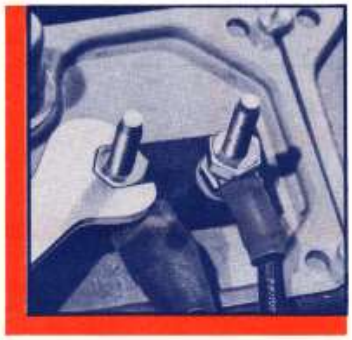
CORRECTING FUEL (GASOLINE) GAUGE TROUBLE—(Continued)

Repairs That You CAN'T Make

For all other troubles, install a new unit. **Always replace with AC product only.**

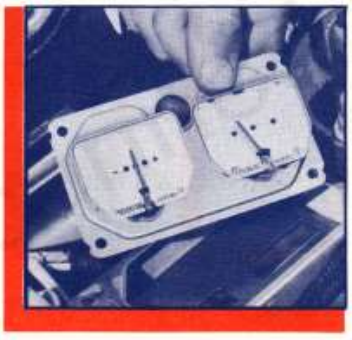
Installing New Fuel Gauge on Instrument Panel

1 Disconnect one of the battery cables.

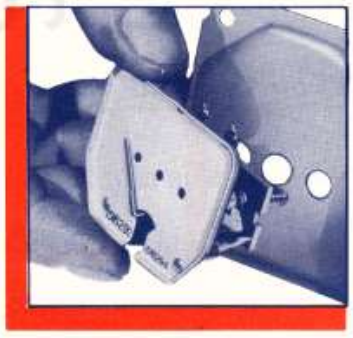


2 Disconnect the two wires attached to the "binding posts" at the back of the fuel gauge.

3 Take off the screws or clamps which hold back plate to the instrument panel.



4 Remove the back plate on which the gauge is mounted.



5 Take off the two screws which hold the gauge to the back plate. Then remove the gauge itself.

6 Set the new gauge in position, reinstall back plate to the instrument panel. Reconnect the wires to the gauge, and reconnect the battery cable. Tighten all connections securely. **NOTE: Never replace an AC product with another make. It will not work!**

WARNING! Be sure to mark one of the wires behind the gauge (such as tying a piece of string to it) so you will be able to tell which wire connects to which binding post on the new instrument. If you connect the wires to the wrong binding posts, you may ruin the new fuel gauge.

CORRECTING FUEL (GASOLINE) GAUGE TROUBLE—*(Continued)*

Installing New Tank Unit

1 Disconnect one of the battery cables.

2 Drain fuel from tank.

3 Back off the nuts which hold the fuel tank tightly inside the steel supporting straps.

4 Drop the fuel tank down about 6 inches.

WARNING! Do not allow the fuel tank to drop farther than 6 inches until you have disconnected the fuel line (tubing). If you do, you may crack or break the line or connections.

5 Disconnect the fuel line.

6 Let the tank down as far as it will go without breaking the wiring attached to the fuel gauge tank unit.

7 Disconnect the wiring from the tank unit.

8 Remove the screws which fasten the tank unit to the tank.

9 Lift out the tank unit. The float and arm will come away with it.

10 Set the new tank unit with gasket, float and arm in exactly the same position. Install all screws and tighten securely. **NOTE: Never replace an AC product with another make. It will not work!**

11 Reconnect the wire to the binding post of the tank unit.

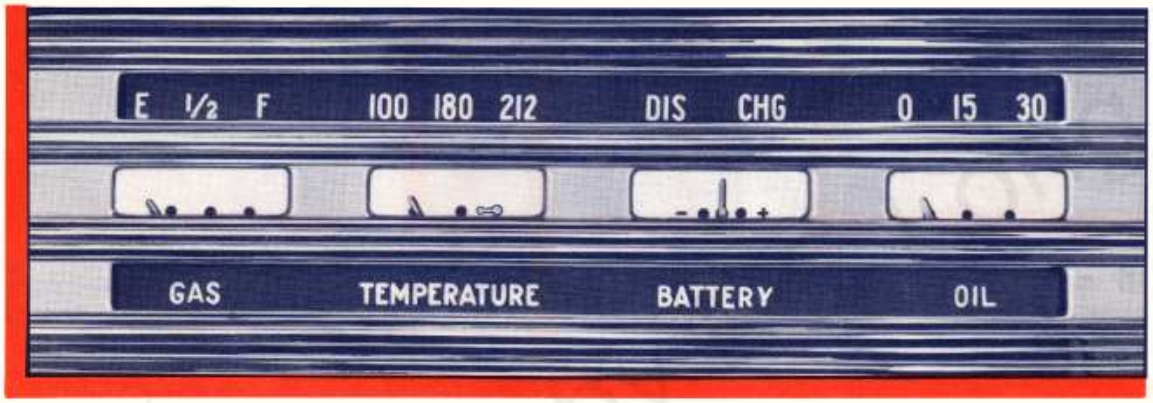
12 Jack up the tank (or slide a box or block under it) so that it is about 6 inches below its normal location.

13 Reconnect the fuel line, and tighten securely.

14 Jack the tank up into position. Leave the jacks in place while fastening the steel straps back into position. Tighten the strap bolts securely.

THE FOUR COMMON INSTRUMENTS

All cars and trucks are equipped with at least four instruments which indicate the operating condition of certain important units of the vehicle. Each of these four instruments is mounted directly in front of the driver, and each tells its own story.



Ammeter

Indicates whether the battery is being charged by the generator, or is being discharged by the lights, engine, radio, etc.

Temperature Gauge

Tells the temperature of the water in the cooling system of the engine.

Oil Pressure Gauge

Shows the pounds of pressure at which the oil is being pushed through the engine by the oil pump.

Fuel (or Gasoline) Gauge

Shows how much fuel there is in the tank.

HOW INSTRUMENTS ARE MOUNTED

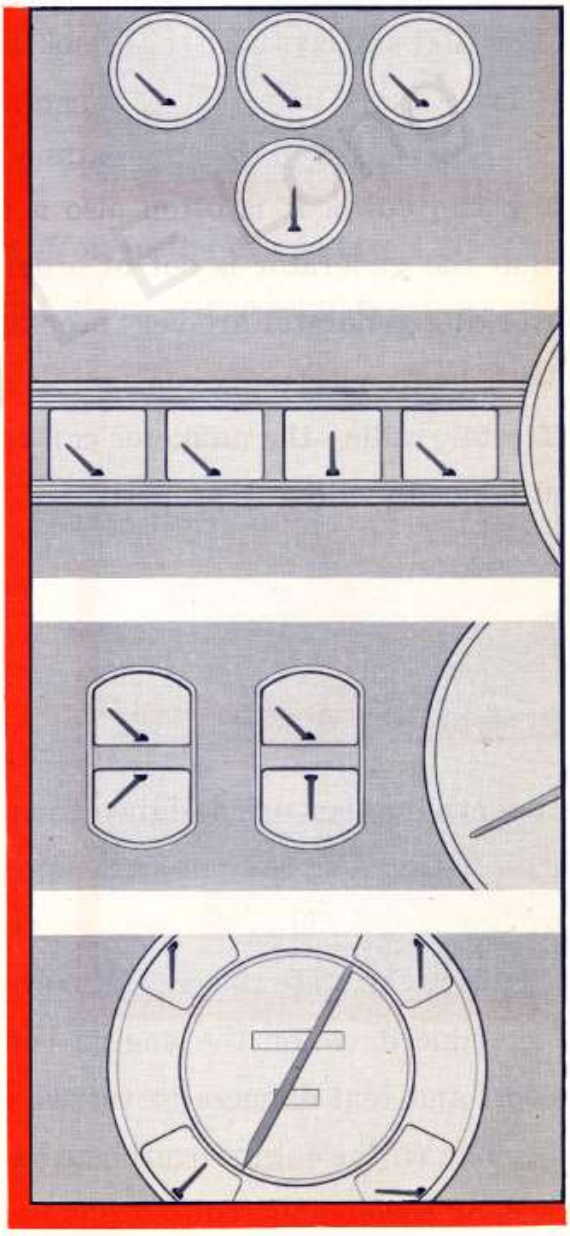
Instruments are mounted on a board or panel in the driving compartment of cars and trucks in one of four ways:

1 Each instrument is set, as a separate unit, in the instrument board.

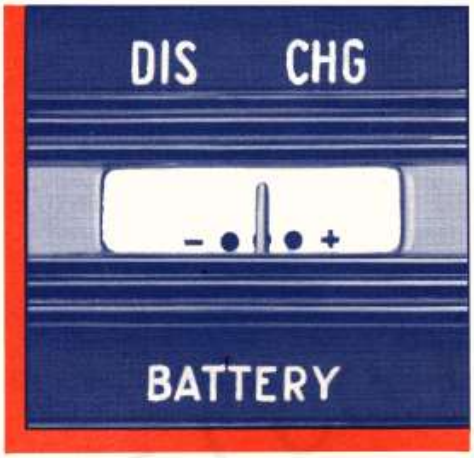
2 Instruments are clustered in a panel, usually under a common crystal or glass, and the panel is set into, or against, the instrument board.

3 Instruments are grouped in pairs, with each pair behind a common crystal. Each instrument in the pair can be removed singly after the pair has been dismounted from the panel.

4 All four instruments are combined with the speedometer, and all are under the speedometer crystal. (With this kind of mounting it is necessary to remove the speedometer in order to get at the other instruments.)

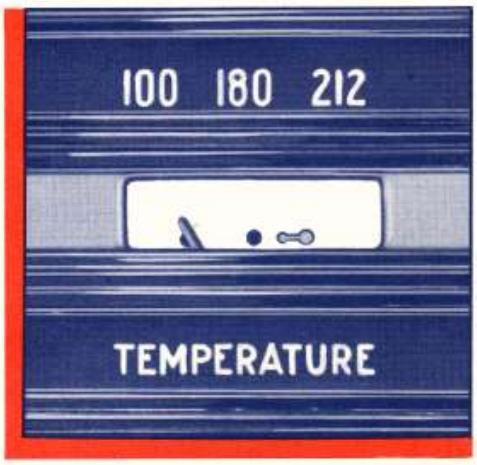


WHY GOOD INSTRUMENTS ARE NECESSARY



Ammeter

The biggest reason for an ammeter is the fact that it shows whether or not the battery is being charged. A constant discharge is a signal that the battery is being run down. It is often also a signal that the generator is out of order. Since both a charged battery and a working generator are very necessary—especially with vehicles equipped with many electricity-consuming devices such as heater, fog lights, defroster, radio—the ammeter can cause the owner quite a little expense if it is not functioning properly.

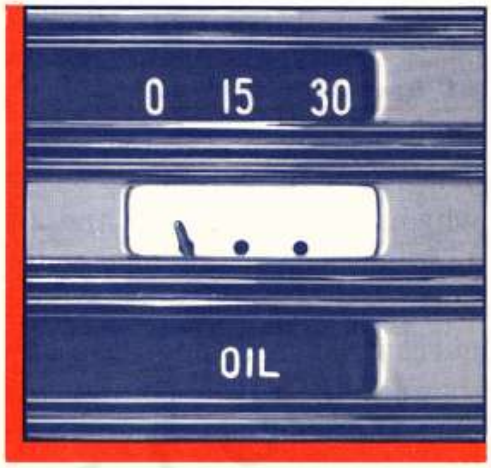


Temperature Gauge

Modern engines are designed to operate best within a fairly narrow temperature range—from 150 to 180 degrees. Outside of this range, gas mileage and power will be reduced (when the engine runs too cool) and real damage to valves, spark plugs and pistons and rings can be done (if the engine overheats badly). Burned and warped valves cause loss of power and reduced gas economy.

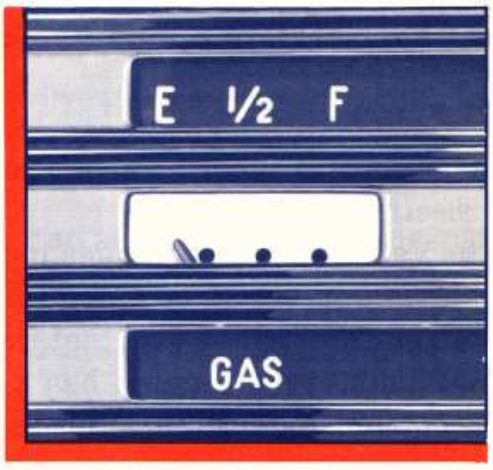
WHY GOOD INSTRUMENTS ARE NECESSARY —(Continued)

Oil Pressure Gauge



If oil pressure drops too low, or disappears entirely, the entire engine can be ruined in a few miles. This is the biggest reason why oil pressure gauges should be kept in perfect condition. A low pressure is a sign that the supply of oil in the crankcase is dangerously low — a condition which can bring about burned out bearings and scored (scratches) cylinder walls and pistons very quickly.

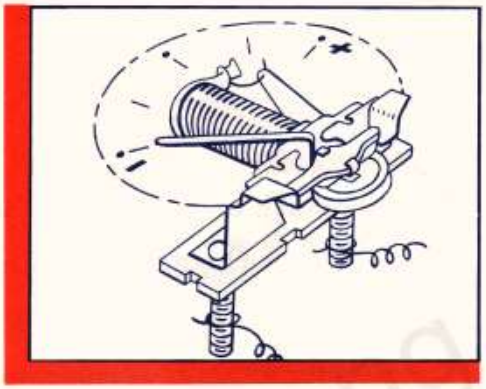
Fuel Gauge



A fuel gauge which doesn't tell a true story of the amount of gasoline in the tank is the most common cause of running out of gas. This is reason enough for keeping the fuel gauge in good operating condition.

HOW THESE INSTRUMENTS FUNCTION

AC Ammeter Operation



The AC ammeter consists of a frame to which is attached a coil and a permanent magnet. The frame also supports an armature and pointer assembly. When no current flows through the ammeter, the magnet holds the pointer armature so that the pointer indicates zero. When current passes in either direction through the coil, the field from the coil attracts the armature away from the effect of the permanent magnet thus giving a reading proportional to the current strength.

When the ammeter must measure high currents, it is connected across a shunt in the line. The proportion of the current taken by the shunt and that taken by the ammeter is about in the ratio of 100:1.2. This permits the use of a standard ammeter for high current measurements.

AC Temperature Gauge Operation

AC temperature gauges can be classed in two general types—Vapor Pressure and Electrical Resistance.

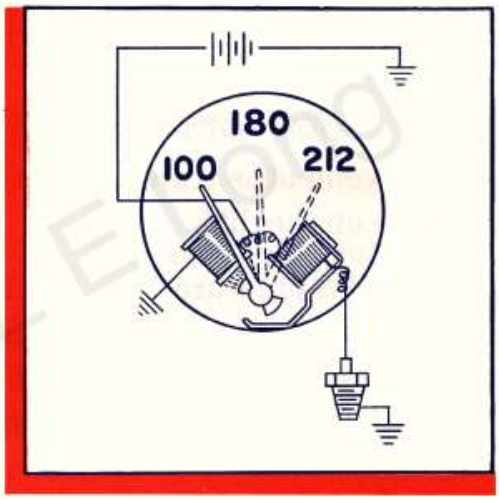
In Vapor Pressure Gauges indication of prevailing engine temperatures is obtained through the fact that the liquid in the bulb, usually ether, has a vapor pressure in direct proportion to the temperature. The temperature indication is not affected by temperature of either the capillary or the gauge head.

The temperature gauge consists of a metal case, enclosing a dial, frame and mechanism assembly.

Hermetically attached to the frame socket is a capillary tube (connector) and immersion bulb.

The immersion bulb contains a liquid, such as ether, whose vapor pressure is proportional to the temperature.

The expanded gas is directed up the capillary tube, and into the curved bourdon tube (C shaped) which has one end fastened to the mechanism frame. The applied pressure has a straightening effect on the bourdon tube and results in its free end moving outward in proportion to the pressure. Since the free end is connected to the pointer by a linkage, the bourdon tube movement is transferred to an indication on the dial. Because the vapor pressure is constant for any given temperature, the dial is calibrated directly in degrees Fahrenheit.



The electric temperature gauge consists of:

1 The indicating unit mounted on the instrument panel.

2 The engine or operating unit installed in the engine.

These two units are connected by a single wire and each unit is grounded in its respective location.

The indicating unit consists principally of two coils spaced 90 degrees apart with an armature and integral pointer at the intersection of the coil axis. An inertia dampener is provided on the armature assembly to prevent vibration of the pointer on rough roads. The dial has a scale graduated in degrees Fahrenheit.

The engine unit has no moving parts and is essentially an electrical resistor which changes resistance with changes in temperature. The unit has a high resistance value when cold and a low resistance value when hot.

The change in engine unit resistance modifies the strength of the indicating unit coils and causes proper indication of the pointer.

AC Oil Pressure Gauge Operation—

Pressure Expansion Type

The oil pressure gauge consists of a metal case, enclosing a dial, frame and mechanism assembly. Oil is admitted through the frame socket and into a bourdon (curved) tube which has one end fastened to the frame. Applied pressure has a tendency to straighten the bourdon type, and results in its free end moving outward in proportion to the pressure.

Since the free end is connected to the pointer by a linkage, the bourdon tube movement is transferred to an indication of pounds per square inch pressure on the dial.

Normal dial pressure indicates only that the oil pump is functioning and that no leaks are present in the lubricating lines. Immediately stop the engine and determine cause, if the oil pressure should fall below the minimum set by the vehicle manufacturer.

Electrical Type

The electric oil gauge consists of:

1. The indicating unit mounted on the instrument panel.
2. The engine or operating unit installed in the engine.

These two units are connected by a single wire and each unit is grounded in its respective location.

The indicating unit consists principally of two coils spaced 90 degrees apart with an armature and integral pointer at the intersection of the coil axis. An inertia dampener is provided on the armature assembly to prevent vibration of the pointer on rough roads. The dial has a scale graduated in pounds per square inch.

The engine unit consists of a housing enclosing a diaphragm and linkage which moves a contact over a resistance proportional to oil pressure.
The change in engine unit resistance modifies the strength of the indicating unit coils and causes proper indication of the pointer.

AC Electric Fuel Gauge Operation

Indicates amount of fuel in the supply tank. Knowing approximate tank capacity and vehicle miles per unit of fuel gives the operator a close check on available mileage before fuel replenishment is necessary.

1. The Indicating or Panel Unit mounted on the instrument panel.
2. The Tank Unit installed in the fuel tank.

These two units are connected by a single wire and each unit grounded in its respective location.

The indicating unit consists of two coils spaced 90 degrees apart with an armature and integral pointer at the intersection of the coil axis. An inertia dampener is provided on the armature assembly to prevent vibration on rough roads. The dial has a scale graduated in fractions between "Empty" and "Full."

The Tank Unit consists of a housing enclosing a rheostat or resistance unit with a brush which contacts the resistance unit. This contacting brush is actuated by the float arm—movement of which is controlled by the height of the fuel in the fuel tank. Variations in resistance (height of fuel) change the value of the indicating unit coils so that the pointer registers fuel availability. A calibrated friction brake is included to prevent wave motion of fuel in tank from registering on the indicating unit.

QUESTIONS AND ANSWERS

QUESTION: What is the purpose of an ammeter?

ANSWER: It indicates performance of the generator circuit.

QUESTION: What are the principal causes of inaccuracies in fuel gauges?

ANSWER: Inaccurate readings result from loose or dirty terminal or bayonet connections and poorly grounded tank or indicating unit.

QUESTION: Is it always necessary to replace indicating and engine or tank units of the electrical type at the same time?

ANSWER: No. This is seldom necessary. Always disconnect the engine unit and test the indicating unit. Replace the indicating unit if it is faulty; otherwise replace the engine or tank unit. **Always replace with AC product only.**

QUESTION: How are instruments removed from panels or dash boards?

ANSWER: Gauges are usually held to panel by brackets and nuts. Disconnect wiring before removing bracket. If the gauge is of the capillary type also remove bulb from engine or transmission.

QUESTION: Does an oscillating ammeter pointer indicate something wrong with the instrument or the electrical circuit?

ANSWER: No. This oscillation is normal when the battery is in a fully charged condition.

QUESTION: If ammeter pointer sticks or does not return to zero, what is the remedy?

ANSWER: Open battery circuit and replace ammeter. **Always replace with AC product only.**

QUESTION: What troubles may be present when the temperature gauge indicates extreme heat?

ANSWER: 1. Broken or loose fan belt. 2. Frozen or obstructed radiator. 3. Thermostat or pressure cap out of order. 4. Insufficient oil or coolant. 5. Gauge may be defective.

QUESTION: What does normal pressure on the oil gauge indicate?

ANSWER: The oil pump is functioning and that no leaks are present in the lubricating lines.