FORD GENERATOR AND STARTER SERVICE

Coming . . .

"1960 CAR RADIO, SPEEDOMETER, AND CLOCK SERVICE"

The 1960 Forum No. 8 will include service procedures on Car Radio, Speedometer and Clock.

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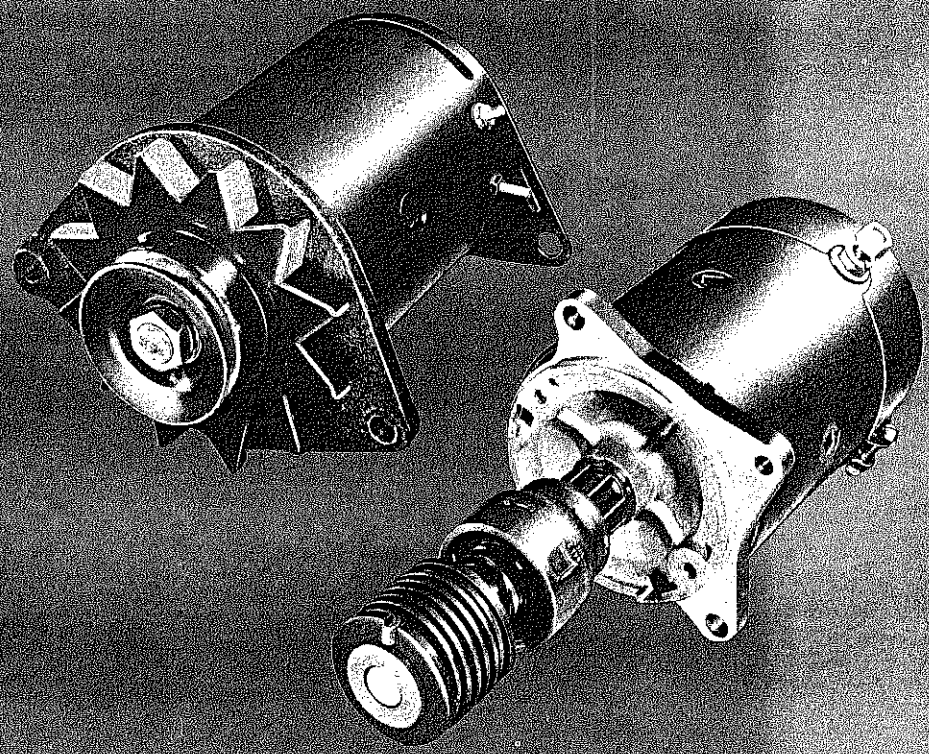
THE FORD

SERVICE

TECHNICIAN



1960 FORD SERVICE FORUM • No. 7

FORD GENERATOR AND STARTER SERVICE

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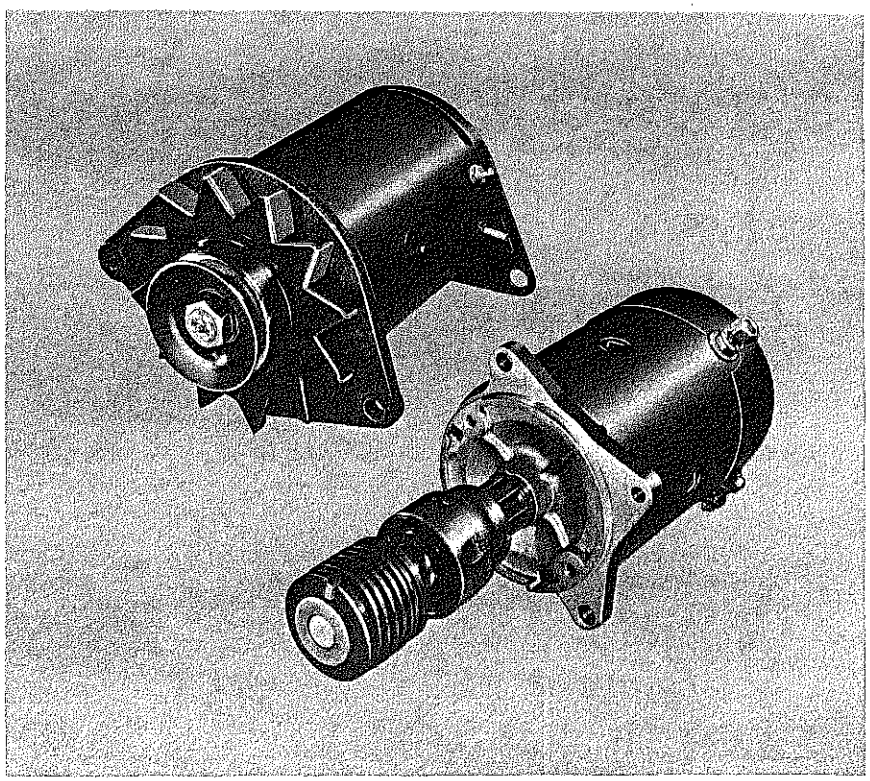
Introduction



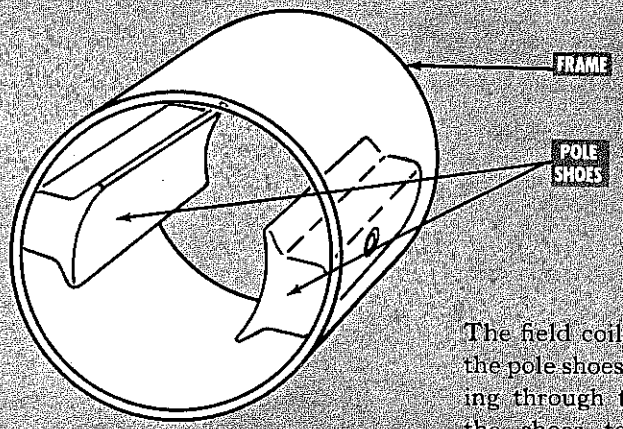
A variety of generators and starter motors are used on 1960 Ford cars and trucks, and on the Thunderbird and Falcon. Among these are units built by Ford, Delco-Remy, Auto-Lite and Bosch.

Some generators are standard equipment, while others provide an option to meet the increased requirements of accessories such as air conditioners and electric windshield wipers.

The variation in starter motors applies primarily to those used on Ford trucks, where extra capacity is needed for the higher powered engines.

In all cases, it is recommended that the rated output of generators and the current draw requirements of starter motors be determined before servicing these units. This information is given in the Specifications Sections on Pages 30 and 31 of this book.

Operation

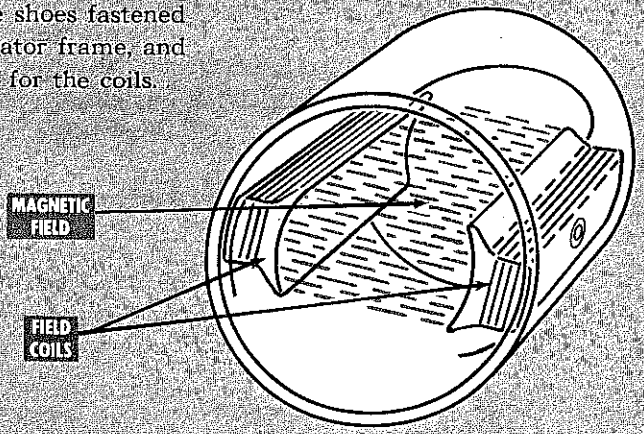


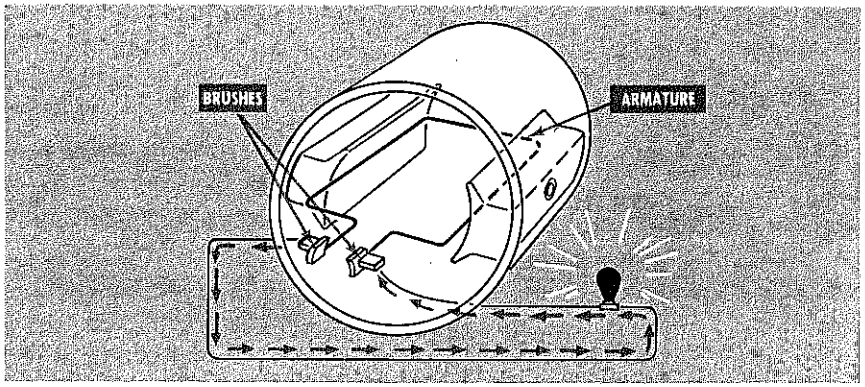
A generator is a device for converting mechanical energy into electrical energy. This is done by revolving electrical windings through a magnetic field.

The magnetic field is created by two soft iron pole shoes fastened to the steel generator frame, and forming the cores for the coils.

The field coils are wound around the pole shoes so that current flowing through the windings causes the shoes to become magnets, creating the magnetic field between them.

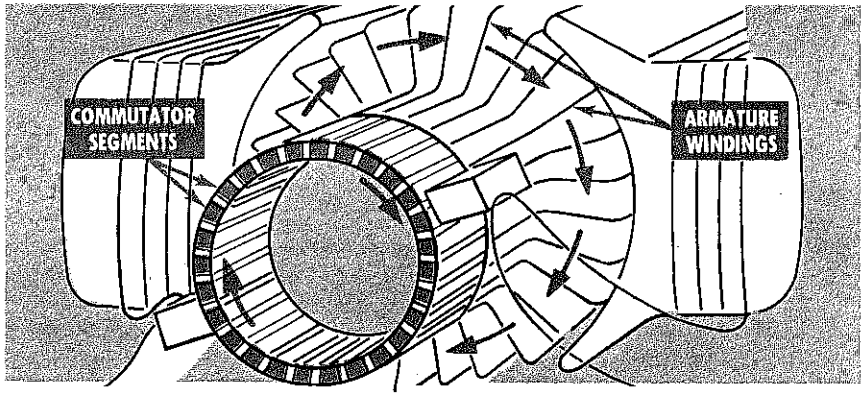
As the armature windings rotate in the magnetic field, a current is induced which travels through the field windings to the brushes, and from them through the external circuit of the car.





In order to produce a continuous flow of current, a practical generator has many field and armature windings. As the armature revolves, each winding passes current through its commutator segment when it contacts the brushes.

Each brush is one and one-half the width of a commutator segment. Therefore, the current transfer overlaps and a steady flow of current is delivered to the electrical system of the car whenever the generator is operating.



New or rebuilt generators sometimes may have no residual magnetism in the pole shoes. In this case, they must be polarized by passing a current through the field windings to magnetize the shoes before the generator will operate.

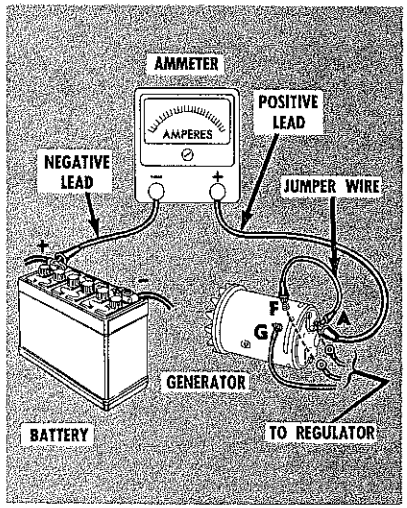
When the generator is not operating and the flow of current through the field coil stops, a small amount of residual magnetism remains in the pole shoes, and makes possible the generation of current when the armature again begins to revolve.

Preliminary Checks

Trouble in the electrical supply system can be due to a number of causes that do not involve improper operation of the generator itself.

Therefore, it is important to eliminate the battery, the regulator and the wiring circuit as possible causes of trouble before concluding that the generator is defective.

When this routine of preliminary checks has been performed, and no reason for failure of the electrical supply system is discovered, it is reasonable to assume that the generator is not producing its rated output.



Output Test

Usually, the output rating of the generator is stamped on the frame, but in some cases, only the part number appears. This part number always should be checked to find the rated output which may be 30, 35, 40 or 50 amperes. The next step is to make an on-the-car output test of the generator, using the hookup shown on this page.

First, disconnect the regulator armature and field wires at the generator. This takes the regulator out of the circuit so that the test will show the unregulated output of the generator.

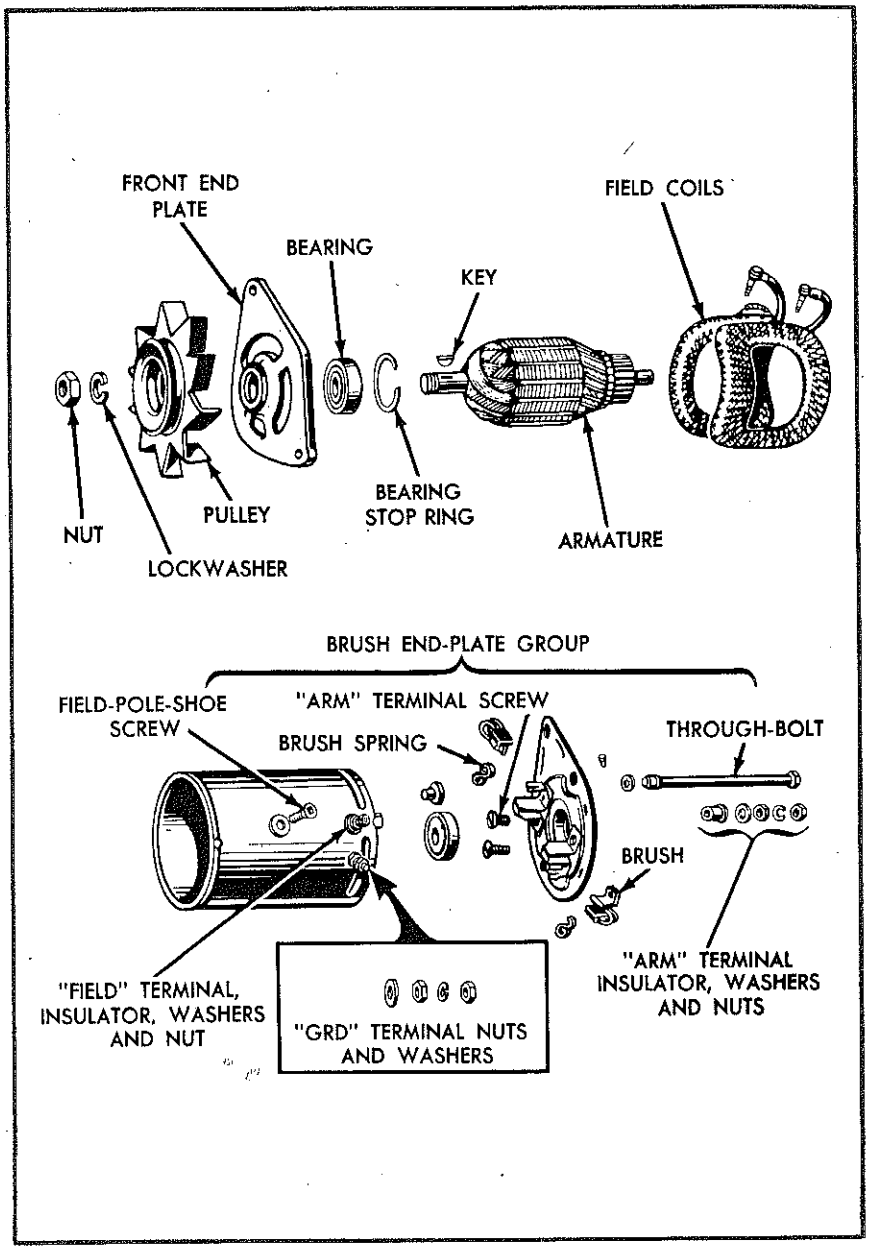
Connect a jumper wire from the generator field terminal to the armature terminal. Then connect the positive lead of a zero to one hundred ammeter to the generator armature terminal.

Start the engine, and while it is idling, connect the ammeter negative lead to the battery positive terminal. Then accelerate the engine to about 1600 rpm and note the ammeter reading. It should reach or exceed the specified rated output of the particular generator being tested.

If it does not, check for worn or stuck brushes and if this is not the trouble, remove the generator from the car so it can be disassembled and tested on the bench to find and correct the trouble.

IMPORTANT: Remove the test leads as soon as the reading is taken to prevent overheating the generator.

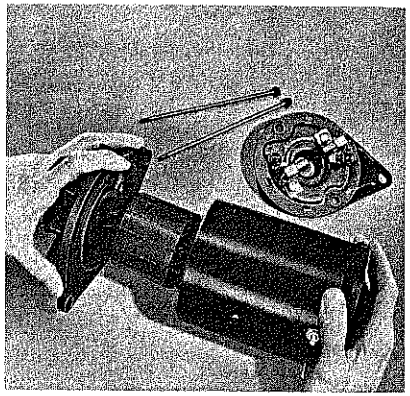
Construction



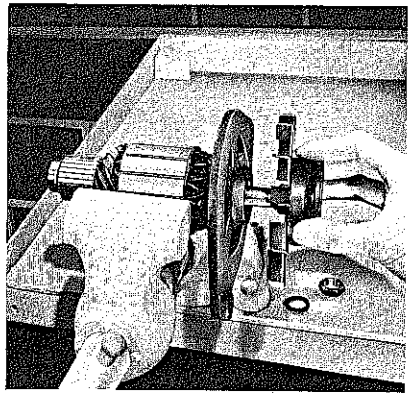
Disassembled View of Ford Generator

Disassembly

The first step in disassembling the generator is to take out the through bolts, and remove the brush end plate. Then slide the armature out of the frame. Be careful not to lose the locating dowel which may drop out during this operation.

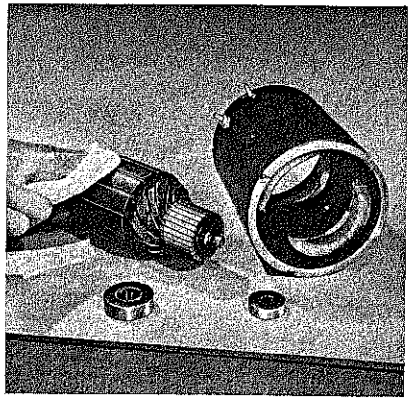


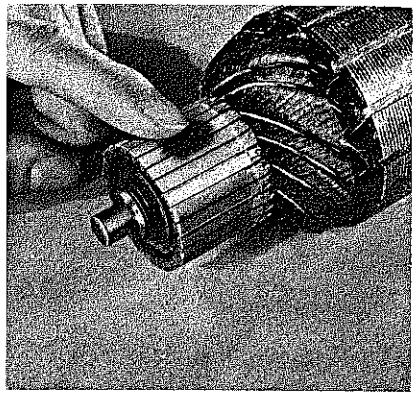
Clamp the armature in a vise with soft jaws, and remove the retaining nut, lockwasher, pulley and woodruff key from the armature shaft. Slide the front end plate off the shaft. Be sure to remove any burrs from the keyway before removing the end plate.



Remove the bearings from the armature shaft, using puller 10094.

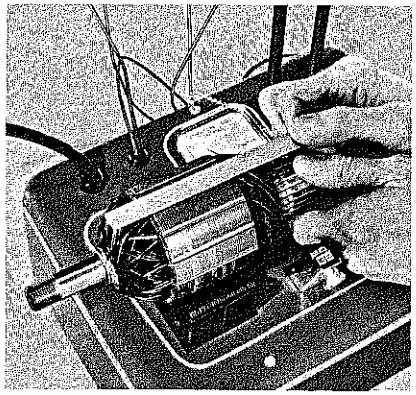
Wipe off all grease and blow any dust deposits from the armature and field windings, the commutator, the armature shaft, and the bearings. **Never immerse these parts in solvent.** All other parts should be cleaned in approved solvent and thoroughly dried.





Armature "Growler" Test

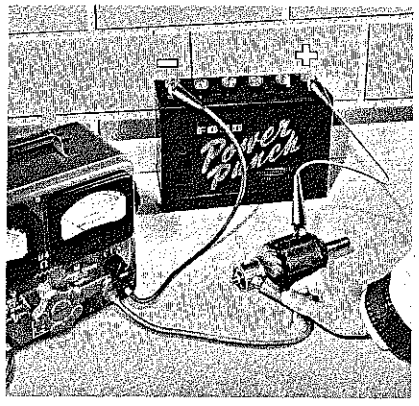
Check the commutator for burned spots which indicate the possibility of an open circuit. Burned spots are caused by an arc formed every time the commutator segment connected to an open circuit passes under a brush.



Use a "growler" to test the armature for short circuits in the windings. As the armature is rotated slowly, the steel strip will vibrate whenever a shorted winding passes under it.

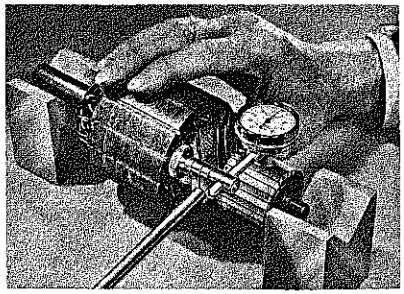
Armature Ground Test

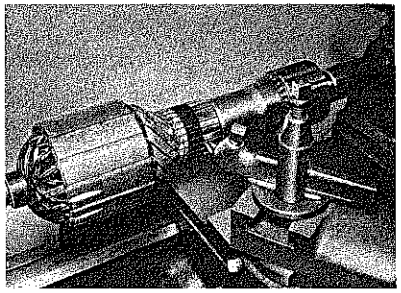
Make a grounded circuit test by connecting a jumper wire from a segment of the armature to the positive post of a fully charged battery. Then connect the voltmeter negative lead to the battery negative post and touch the voltmeter positive lead to the commutator. Do not touch the test leads to the bearing surfaces.



If the voltmeter indicates any voltage, the armature windings are grounded to the core. Replace the armature if any grounded, open or short circuits are detected.

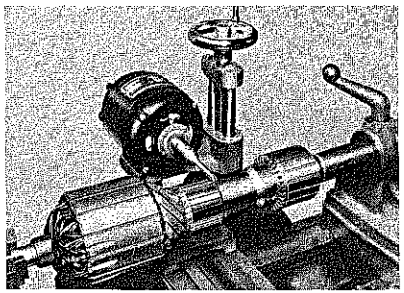
Disassembly





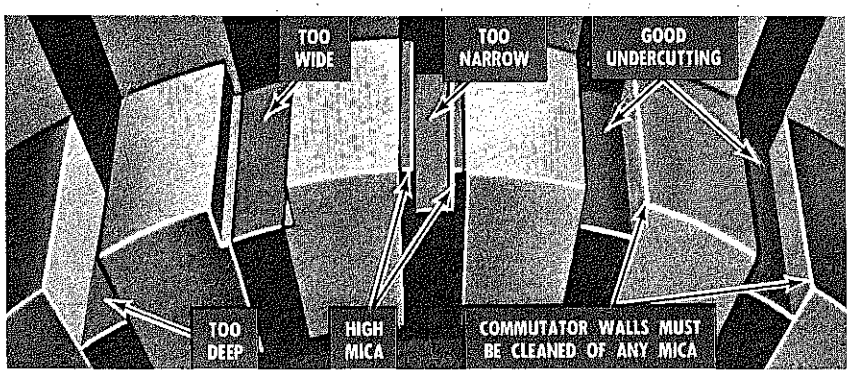
Armature Runout Check

Check the commutator for runout with V-blocks and a dial indicator. Runout should not exceed 0.002 inch. If it does or the surface of the commutator is grooved, turn it down on a lathe. Be careful to remove only enough copper to do the job properly.



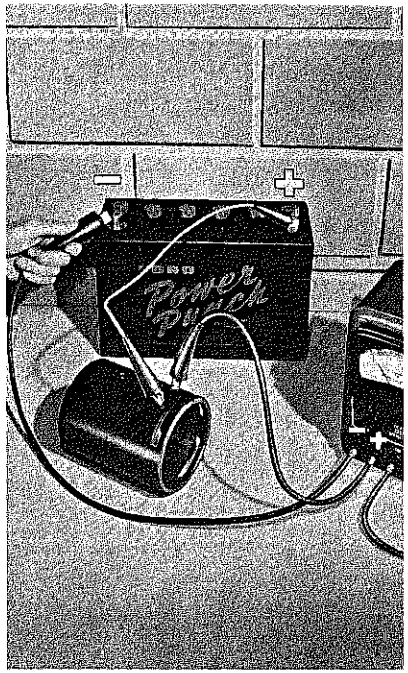
Armature Turning and Undercutting

After the turning operation, undercut the mica to 1/32 inch below the copper.



It is important that undercutting be done very carefully, so that the cut is not too deep, too shallow, or too wide.

Then polish the surface of the commutator with crocus cloth, and remove particles of copper between the commutator segments.

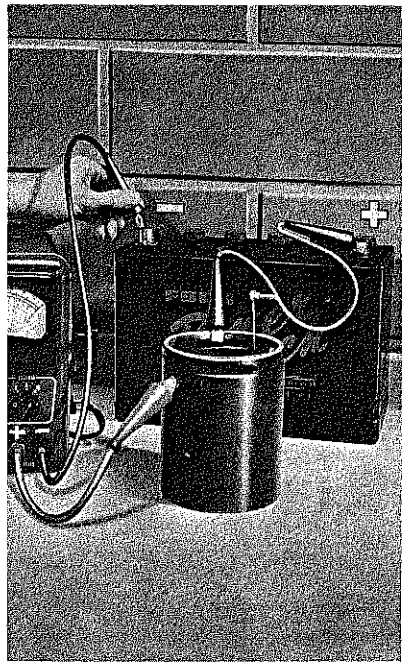


Field Winding Tests

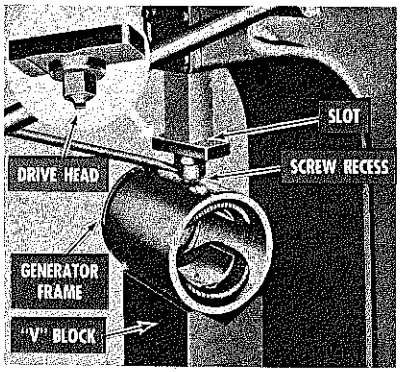
Test the field windings for open, shorted or grounded circuits. To perform this test, first connect a jumper wire from the generator ground terminal to the positive post of the battery. Then connect the positive lead of a 0-5 ammeter to the field terminal of the generator. Touch the ammeter negative lead to the battery negative post.

The ammeter should read 1.5 to 1.6 amperes. If there is little or no current flow, the field is open or has high resistance. But, if the reading is more than the specified limit, a short in the field is indicated.

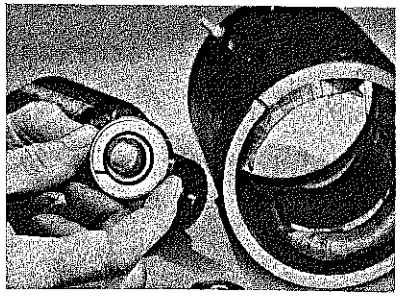
A ground test is made by removing the ground terminal screw from the generator frame, and connecting a jumper wire from the battery positive post to the generator frame. Then connect the voltmeter positive lead to the field terminal screw. Carefully hold the ground terminal screw and lead away from the frame, and touch the voltmeter negative lead to the battery negative post. If any voltage is obtained, the field coils are grounded and should be replaced. The field coils and pole shoes need not be removed from the frame unless the foregoing tests show an open, shorted or grounded condition.



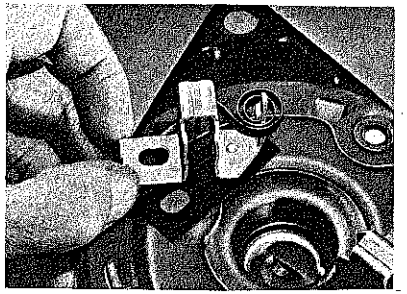
Inspection of Parts



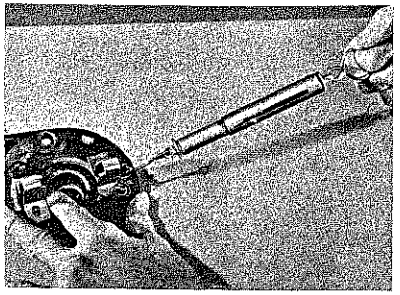
If the condition of the field coils requires replacement, remove the field terminal screw from the frame. Then using an arbor press to hold the special tool firmly in the screw slots, unscrew the pole shoe screws and slide the shoes and field windings out of the frame. Separate the windings and the shoes and install new windings during the assembly of the generator.



Inspect both ball bearings for wear. Rotate the inner race against the outer race. If it has a rough action, replace it. Also, if the bearing surfaces are blue from loss of lubricant, replace it.

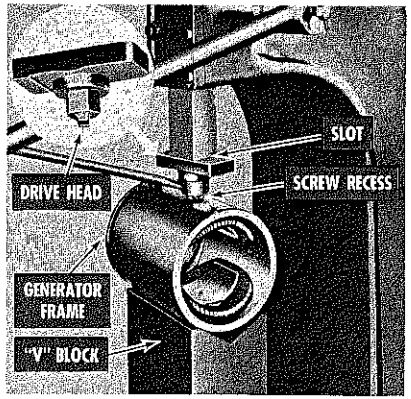


Inspect the brush end plate for chipped insulation or loose rivets. Replace the plate if it is not in satisfactory condition for use.

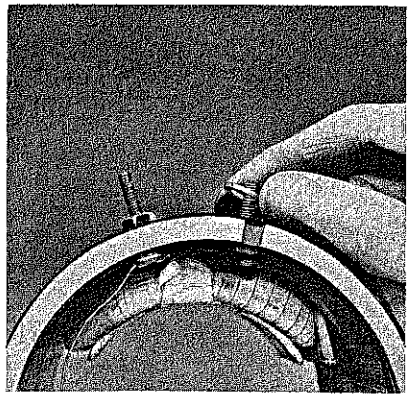


Check the tension of the brush springs. If the tension is not within specifications, replace the springs.

The first step in assembling the generator is to install the field coils on the pole shoes, and mount the shoe and coil assemblies in the generator frame.



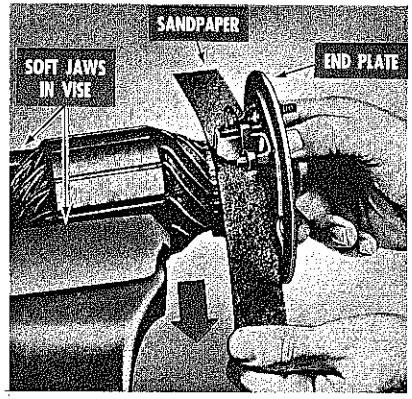
Install and tighten the field pole shoe screws with an arbor press and special tool No. 10044-A. As the screws are tightened, strike the frame of the generator several sharp blows with a soft-faced hammer to seat and align the pole shoes. Stake the screws after tightening.



Install the ground terminal and field terminal screws. Be careful not to omit the insulating washer on the field terminal screw. Press the bearing on the commutator end of the armature shaft.

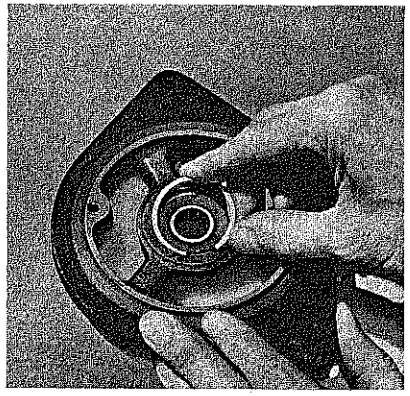
Assembly

Insert new brushes in the brush holders and, while holding the end plate from turning, seat the brushes by drawing a strip of sandpaper between the brush and commutator in the direction of commutator rotation. Then move the brushes up in the brush holders so that the springs hold the brushes in the retracted position.

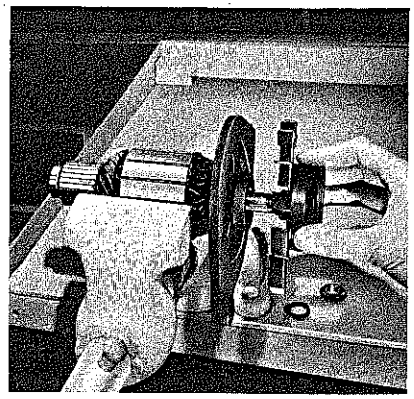


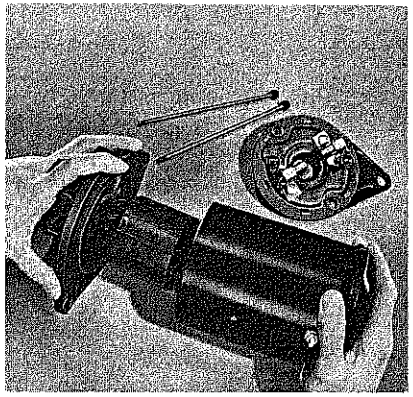
Install the armature terminal screw and insulators, and the ground brush screw.

Install the bearing in the front end plate and insert the bearing stop ring.

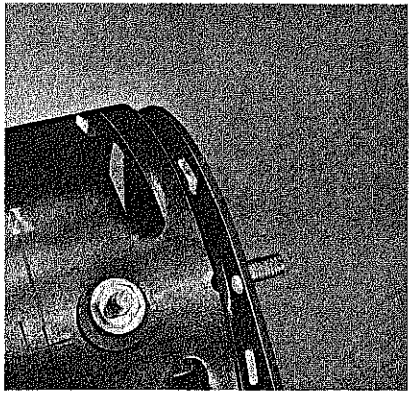


Slide the plate on the armature shaft, with the stop ring toward the armature windings. Install the woodruff key, pulley, lockwasher and retaining nut.

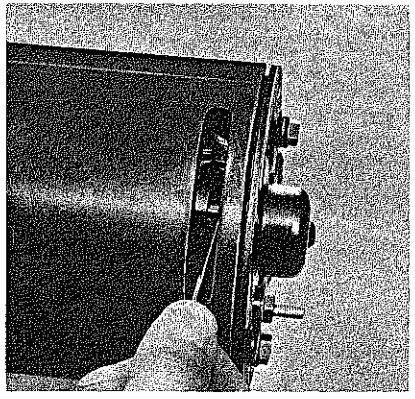




Install the armature and front end plate in the frame, making sure to locate the dowel in the frame groove.



Install the brush end plate, being careful to align the dowel and frame groove. Then install the through bolts and lockwashers.



Use a stiff wire with a hooked end to reach through the ventilating slits in the frame and position the brush springs on top of the brushes.

IMPORTANT: If this step is not taken, the generator will not produce any current.

Before installing the generator in the car, test it for output to be sure it is reaching its rated capacity.

Specifications

1960 CAR

GENERATORS

Part Number	Application: Vendor and Eng. Cu. In. Displ.	Application: Factory Installed Equipment	Amperes (@ 15 V)	Watts (@ 15 V)	Field Current (Amps. @ 12 V hot)	Cut-In Speed (Generator rpm)*	Rated Output Speed (Generator rpm)*	Pulley: Pitch Diameter (Inches)	Pulley: Belt Width (Inches)	Brushes: Number Used	Brushes: Original Length (Inches)	Brushes: Spring Tension (Ounces)
STD.												
39A-10002-A	Ford 223	Vacuum W/S Wipers	30	450	1.2-1.8	1300	2525	2.7	⅜	2	0.860	32-40
38A-10002-A	Ford 223	Electric W/S Wipers	35	525	1.2-1.8	1460	2670	2.7	⅜	2	0.860	32-40
39A-10002-A	Ford 292	Vacuum W/S Wipers	30	450	1.2-1.8	1300	2525	2.9	⅜	2	0.860	32-40
38A-10002-A	Ford 292	Electric W/S Wipers	35	525	1.2-1.8	1460	2670	2.9	⅜	2	0.860	32-40
38A-10002-A	Ford 292	SelectAire	35	525	1.2-1.8	1460	2670	2.9	⅜	2	0.860	32-40
38QH-10002-A	Ford 292	SelectAire Electric W/S Wipers	40	600	1.2-1.8	1550	2650	2.9	⅜	2	0.860	32-40
39A-10002-A	Ford 292	PolarAire	30	450	1.2-1.8	1300	2525	2.9	⅜	2	0.860	32-40
39A-10002-A	Ford 352	Vacuum W/S Wipers	30	450	1.2-1.8	1300	2525	2.9	⅜	2	0.860	32-40
38A-10002-A	Ford 352	Electric W/S Wipers	35	525	1.2-1.8	1460	2670	2.9	⅜	2	0.860	32-40
38A-10002-A	Ford 352	SelectAire	35	525	1.5-1.8	1460	2670	2.9	⅜	2	0.860	32-40
38QH-10002-A	Ford 352	SelectAire Electric W/S Wipers	40	600	1.2-1.8	1550	2650	2.9	⅜	2	0.860	32-40
39A-10002-A	Ford 352	PolarAire	30	450	1.2-1.8	1300	2525	2.9	⅜	2	0.860	32-40
OPT												
36A-10002-F	Auto-Lite 223		40	600	1.2-1.8	960	1800	2.7	⅜	2	0.937	34-41
COAF-10002-B	Delco-Remy All		40	600	2.4-3.0	1325	2300	2.4	⅜	2	1.000	28
36A-10002-D	Bosch 223	Unavailable with AC or PS.	50	750	1.2-1.8	900	1380	3.0	⅜	4	1.125	16-18
36A-10002-D	Bosch 292, 352		50	750	1.2-1.8	900	1380	3.25	⅜	4	1.125	16-18

*To find the equivalent engine rpm, divide the crankshaft pulley diameter by the generator pulley diameter, and multiply by the generator rpm.

1960 CAR

STARTER MOTOR

Part Number	Current Draw Under Load (Amperes)	Normal Engine Cranking Speed (rpm)	Minimum Stall Torque @ 5 Volts (Foot Pounds)	Maximum Load (Amperes)	Teeth in Pinion	Teeth in Ring Gear	Gear Ratio	Maximum No Load Amperage
B6A-11002-A	155-190	150-180	15.5	550	9	146	16.2	110

STARTER BRUSHES

Minimum Mfg. Length (Inches)	Wear Limit (Inches)	Brushes Spring Tension (Ounces)	No. Used
0.43-0.46	5/16	48-56	4

1960 FALCON

GENERATOR

Part Number	Field Current Draw Amperes @ 12 V: Hot	Field Current Draw Amperes @ 12 V: Cold	Watts	Gen. rpm Charge Starts*	Maximum Rate: Amps.	Maximum Rate: Gen. rpm*	Pulley: Drive Ratio	Pulley: Belt Width (In.)	Pulley: Pitch Diameter (Inches)	Brushes: No.	Brushes: Original Length (Inches)	Brushes: Spring Torsion (Oz.)
CODF-10002-C	1.2-1.8	1.7-2.0	375	1400	25	2450	2.00:1	⅜	2.7	2	0.86	32-40
CODF-10002-D	1.2-1.8	1.7-2.0	450	1300	30	2525	2.00:1	⅜	2.7	2	0.86	32-40

External Circuit Resistance (generator armature terminal to battery positive terminal: 0.6 Volt Maximum @ 25 Amperes)
Maximum Commutator Runout: 0.002 inch.
*To find equivalent engine rpm, divide by drive ratio of generator pulley.

STARTER MOTOR

Part Number	Normal Engine Cranking rpm	Min. Torque @ 5 Volts: Ft.-Pounds (Min.)	Min. Torque @ 5 Volts: Amp. Load (Max.)	Maximum Commutator Runout (Inches)	No Load Amperage @ 12 V
CODF-11001-A	250-290	15.5	670	0.002	70

Current Draw under load (Engine at normal operating temperatures) 100-150 Amperes.

STARTER MOTOR BRUSHES

Mfg. Length (Min.) (Inches)	Wear Limit (Inches)	Brush Spring Tension (Ounces)	No. Used
0.46-0.48	½ Size	42-53	4

1960 TRUCK

GENERATOR

Part Number	Watts @ 15 Volts	Gen. rpm Chg. Starts*	Max. Rate: Amp.	Max. Rate: Gen. rpm*	Field Current Amps. @ 12 Volts Hot	Brushes: No. Used	Brushes: Orig. Length (In.)	Brushes: Spring Tension (Oz.)
Ford B9A-10002-A	450	1300	30	2525	1.20-1.80	2	0.86	32-40
Ford B8QH-10002-A	600	1550	40	2500	1.44-1.50	2	0.86	32-40
Auto-Lite B6A-10002-E-F	600	960	40	1800	1.20-1.80	2	0.937	34-41

*To find the equivalent engine rpm, divide the crankshaft pulley diameter by the generator pulley diameter and multiply by the generator rpm.

STARTER MOTOR

Part Number	Normal Engine Cranking Speed	Min. Torque @ 5 Volts: Foot Pounds (Min.)	Min. Torque @ 5 Volts: Load (Amp.) (Max.)	Maximum No Load Amperage @ 12 Volts	Current Draw Under Load	Type of Drive	No. Brushes Used	Brush Mfg. Length (Min.) (Inches)	Brush Wear Limit (Inches)	Brush Spring Tension (Ounces)
Ford B6A-11002-A	150-180	15.5	550	110	150-190	Folo-Thru	4	0.43-0.46	Half Size	48-56
Delco B7T-11002-A	150-160	14.2	525	80	150-190	Positive Action	4	0.61-0.63	Half Size	35
Auto-Lite B8QH-11002-A	140-160	17.2	525	60	170-220	Folo-Thru	4	0.46-0.48	Half Size	42-53
Auto-Lite B8C-11002-A	140-160	15.5	550	85		Positive Action	4	0.46-0.48	Half Size	42-53

1960 THUNDERBIRD

GENERATOR

Part Number	Field Current Draw @ 12 Volts (Amperes)	Maximum Commutator Runout (Inches)	Watts	Gen. rpm Charge Starts*	Maximum Charging Rate: Amperes	Maximum Charging Rate: Generator Speed (rpm)*	Brushes: No.	Brushes: Original Length (Inches)	Brushes: Spring Tension (Ounces)
B9A-10002-A	1.5-1.6	0.002	450	1300	30	2525	2	0.86	32-40
B9FM-10002-A	1.5-1.6	0.002	525	1460	35	2670	2	0.86	32-40

External Circuit Resistance (generator armature terminal to battery positive terminal) 0.7 Volt Maximum @ 30 Amperes.
*To find the equivalent engine rpm, divide the crankshaft pulley diameter by the generator pulley diameter, and multiply by the generator rpm.

STARTER MOTOR

Part Number	Current Draw Under Load (Amperes)	Normal Engine Cranking Speed (rpm)	Minimum Stall Torque @ 5 Volts (Foot-Pounds)	Maximum Load (Amperes)	Maximum No Load Amperage	Maximum Commutator Runout (Inches)
B6A-11000-A FAY-11000-A	155-190	150-180	15.5	550	110	0.002

STARTER BRUSHES

Minimum Mfg. Length (Inches)	Wear Limit (Inches)	Brush Spring Tension (Ounces)	No. Used
0.43-0.46	5/16	48-56	4

STARTER MOTOR

Part Number	Normal Engine Cranking rpm	Min. Torque @ 5 Volts: Ft.-pounds (Min.)	Min. Torque @ 5 Volts: Amp. Load (Max.)	Maximum Commutator Runout (Inches)	No Load Amperage @ 12 V
CODF-11001-A	250-290	15.5	670	0.002	70

Current Draw under load (Engine at normal operating temperatures) 100-150 Amperes.

STARTER MOTOR BRUSHES

Mfg. Length (Min.) (Inches)	Wear Limit (Inches)	Brush Spring Tension (Ounces)	No. Used