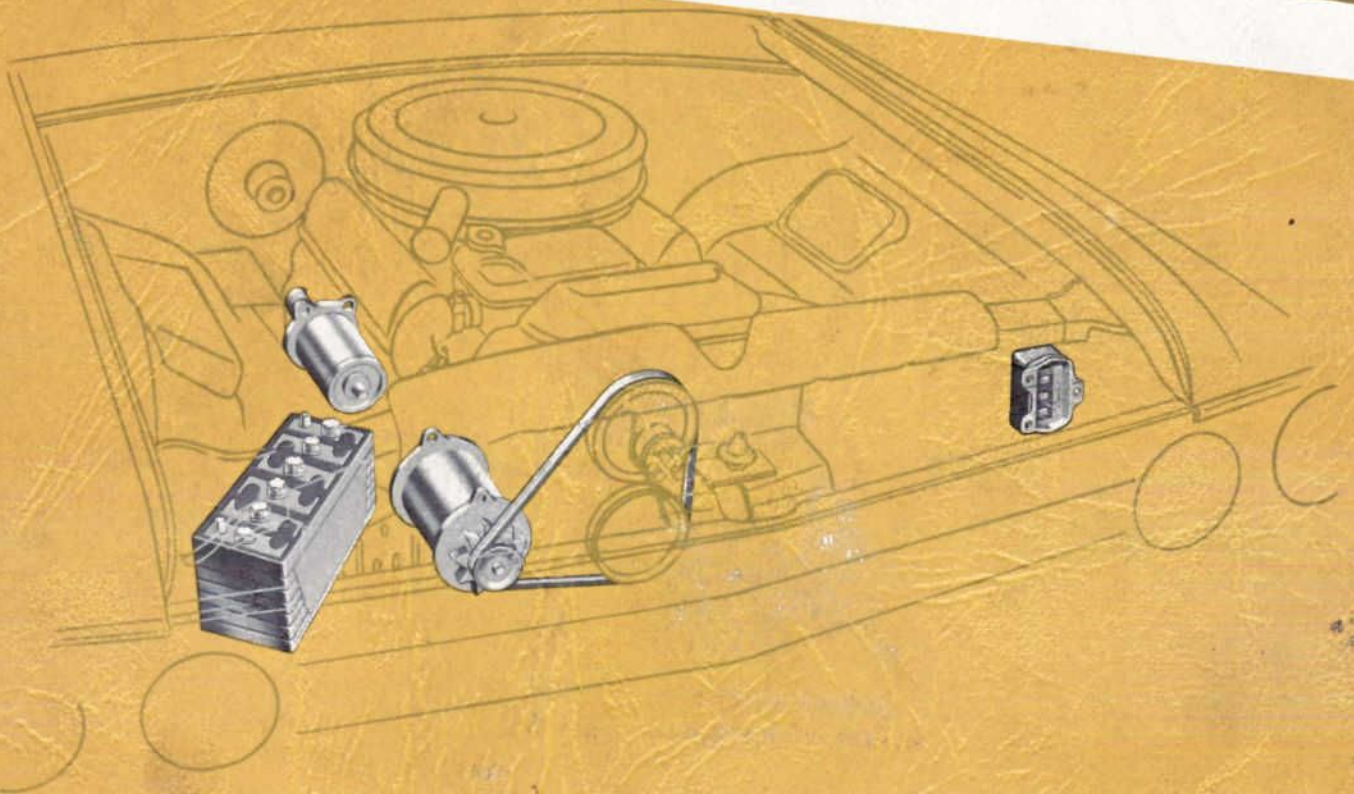


FORD

Service Handbook

100002



**GENERATORS,
ALTERNATORS,
REGULATORS
and STARTERS**

of contents

.....	1
.....	1
.....	2
.....	3
.....	4
PART 2 GENERATOR.....	7
1 Replacement.....	7
2 Overhaul.....	7
PART 3 ALTERNATORS.....	11
1 Replacement.....	11
2 40 Ampere Alternator.....	11
3 Overhaul—60 Ampere Car Alternator.....	12
4 Overhaul—60 Ampere Truck Alternator.....	13
PART 4 REGULATOR REPLACEMENT.....	15
PART 5 STARTERS.....	17
1 Replacement.....	17
2 Starter Overhaul—Falcon and Econoline.....	17
3 Starter Overhaul—Car and Light Truck.....	19
4 Starter Overhaul—Heavy Trucks.....	21
5 24-Volt Starter and Relay Overhaul.....	24
6 Starter Drives.....	26
PART 6 SPECIFICATIONS.....	28

The descriptions and specifications in this handbook were in effect at the time the handbook was approved for printing. Ford Division of Ford Motor Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

SERVICE DEPARTMENT
FORD DIVISION
 **MOTOR COMPANY**
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DEARBORN, MICHIGAN

PART 1

IDENTIFICATION

1 GENERATORS

All generators are identified by the name of the manufacturer and the rating, which are stamped on the outside of the frame.

All gasoline powered vehicles use Ford built generators (Fig. 1) as standard equipment except trucks

with Super Duty engines. Optional generators built by Autolite, and Delco-Remy (Fig. 2) are available also on passenger cars. Bosch generators were also available on cars and trucks from 1959 thru 1960.

Table 1 shows the generator application for 1960, 1961 and 1962.

TABLE 1—1960, 1961 and 1962 Generator Application

Manufacturer	Current Rating @ 15 V	Engine	Vehicle	Year
STANDARD				
Ford	25	144 & 170 Six	Car	1960-1962
Ford	30	6‡ & 8-Cyl.*	Car & Truck	1956-1962
OPTIONAL				
Ford	30	144 & 170 Six	Car	1960-1962
Ford	35	8-Cyl.	Car	1958-1962
Ford	40	6 & 8-Cyl.*	Car & Truck	1956-1962
Autolite	40	6-Cyl.	Car (Taxi) & 6-Cyl. Truck	1956-1962
Bosch	30	6 & 8-Cyl.*	Car & Truck†	1956-1960
Bosch	50	6 & 8-Cyl.*	Car & Truck†	1956-1960
Bosch	60	6 & 8-Cyl.*	Car & Truck†	1956-1960
Delco-Remy	35	144 & 170 Six	Car	1961-1962
Delco-Remy	40	6‡ & 8-Cyl.*	Car	1960-1962

*Except Super Duty Engines

†Except Econoline

‡Except 144 & 170 Six Engines

The standard generators are shunt wound (armature and field circuits connected in parallel), two-brush, high output generators. The field is internally grounded.

The front end of the armature shaft is supported by a permanently lubricated ball bearing which fits in the front end plate. The shaft is keyed to an integral pulley and cooling-fan assembly.

The rear end of the armature is supported by a permanently lubricated ball bearing which is pressed on the commutator end of the armature and slip-fits into the end plate.

All generators are rated at 15 volts but are built to produce 25, 30, 35, or 40 amperes according to the requirements.

The frame of the 25 and 30 ampere Ford generators is 6 inches long. The armature of the 30 ampere generator is wound with heavier gauge wire than the 25 ampere generator.

The frame of the 35 and 40 ampere generators is 6¾ inches long. The armature of the 40 ampere generator is wound with more turns than the armature of the 35 ampere generator.

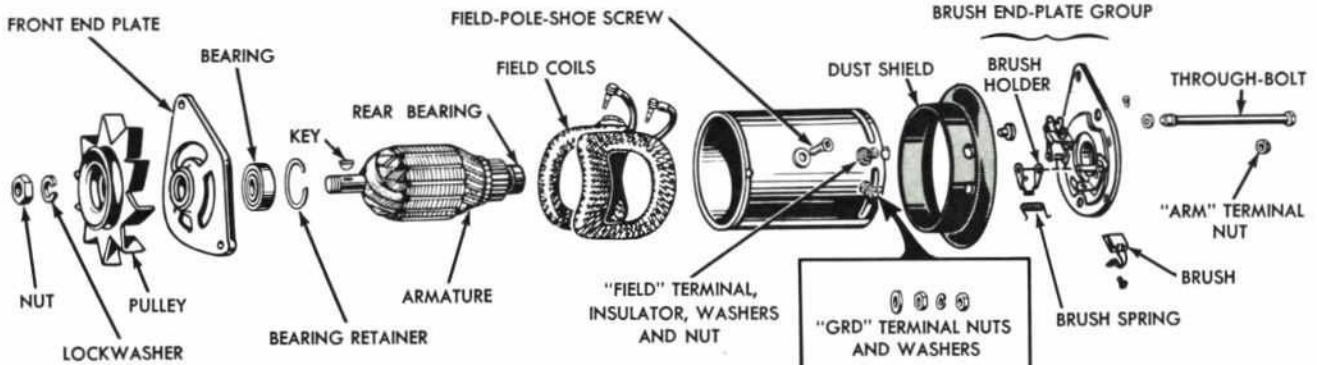
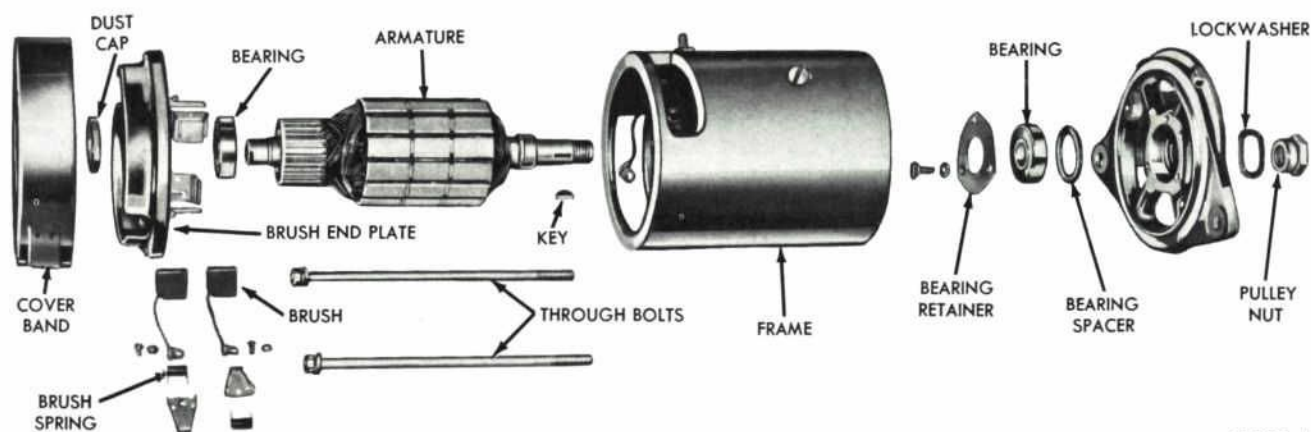


FIG. 1—Disassembled Generator—Typical



J1098-A

Fig. 2—Disassembled Delco-Remy Generator

2 ALTERNATORS

Standard and optional equipment 40 and 60 ampere alternators (Figs. 3, 4 and 5) furnished on Ford products in 1962 are built by Leece-Neville. Alternator application is listed in Table 2.

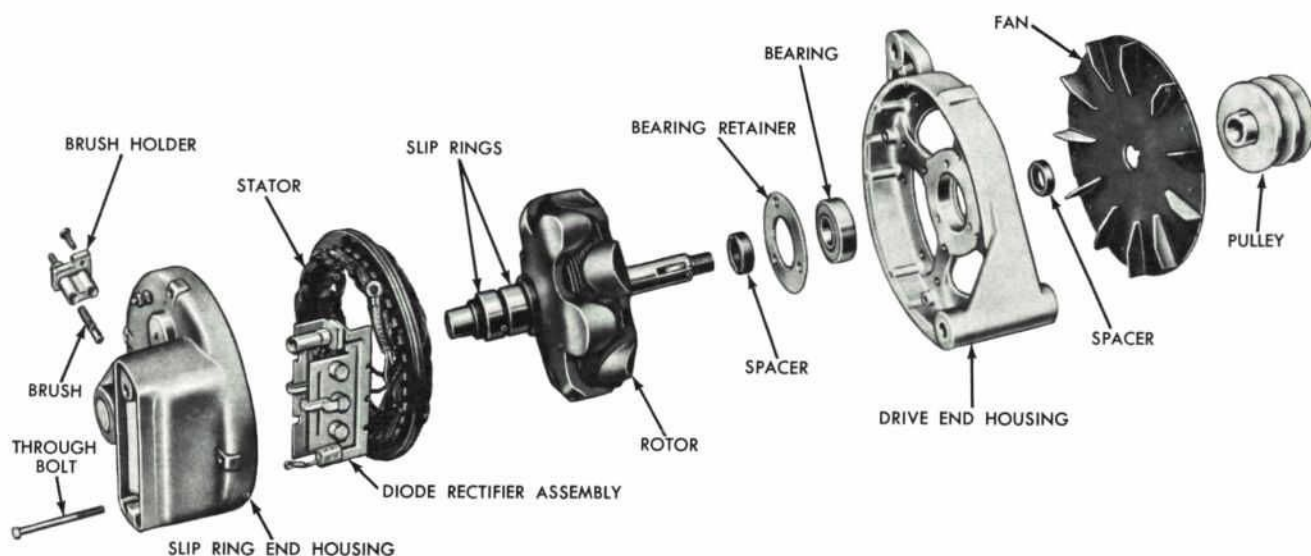
Both the 40 and 60 ampere alternators are built with rectifiers (diodes) installed inside the alternator case.

The 40 ampere alternator is self-current limited. The maximum amount of current the alternator can produce is controlled by the number of laminations in the stator core. The core of the 40 ampere alternator is slightly less than 7/16 inch thick.

The 60 ampere alternator is not self-current regulated and has a thicker core with more laminations than the 40 ampere alternator.

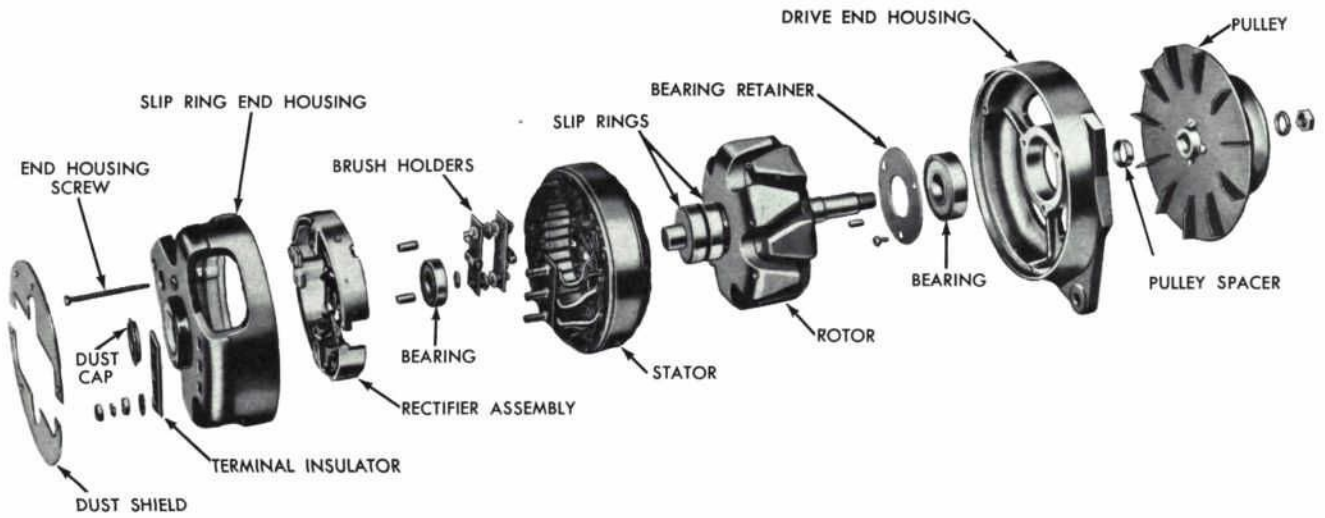
TABLE 2—1962 Alternator Application

Manufacturer	Current Rating @ 15 V	Engine	Vehicle	Year
STANDARD				
Leece-Neville	60	Super Duty and Diesel (Cummins)	Trucks	1961-1962
OPTIONAL				
Leece-Neville	40	6 and 8-Cyl.	Galaxie and Fairlane	1962
Leece-Neville	40	6 and 8-Cyl.	Medium Duty	1962
Leece-Neville	60	6 and 8-Cyl.	Galaxie and Fairlane	1962
Leece-Neville	60	6 and 8-Cyl.	Medium Duty Trucks	1962



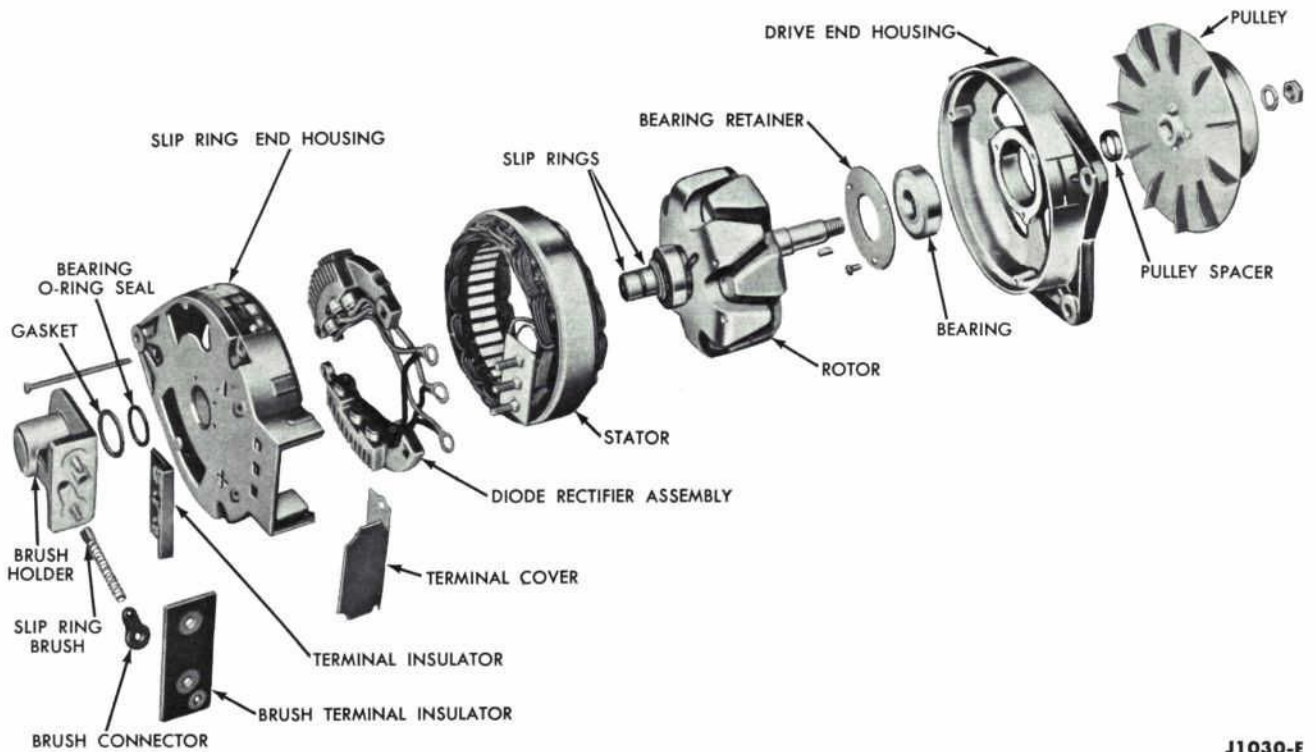
J1124-A

FIG. 3—Disassembled 40 Ampere Alternator



J1190-A

FIG. 4—Disassembled 60 Ampere Truck Alternator



J1030-E

FIG. 5—Disassembled 60 Ampere Car Alternator

3 REGULATORS

Ford and Bosch both build the standard 30 ampere generator regulator. The Ford built regulator is identified by a flat cover and the Bosch is identified by a curved cover (Figs. 6 thru 10).

Three general types of alternator

regulators (Fig. 11) are used; two types for the 40 ampere alternator and the other for the 60 ampere alternator. The 60 ampere regulator has three controlling solenoids. Both 40 ampere alternator regulators have only two solenoids, the cutout and

the voltage limiter, because of the self-current limiting qualities of the alternator. One of the 40 ampere regulators has five terminals. The extra terminal is indicated by an "L" and is connected to an indicator light which is used instead of an ammeter.

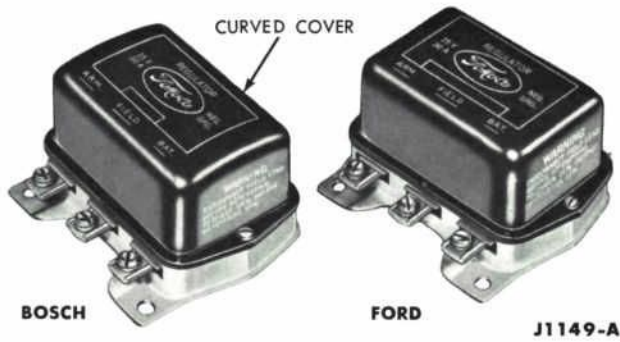


FIG. 6—Standard 30 Ampere Regulators

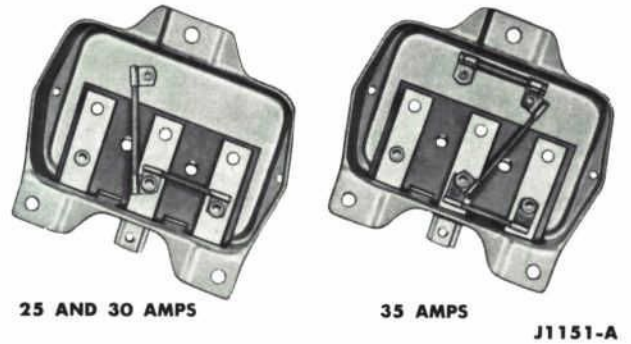


FIG. 7—Generator Regulators—Bottom View



FIG. 8—Heavy Duty Generator Regulators—1960

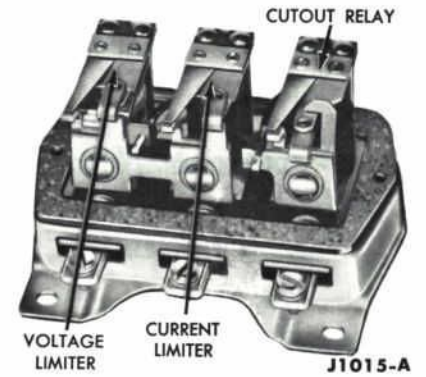


FIG. 9—Generator Regulator—Cover Removed

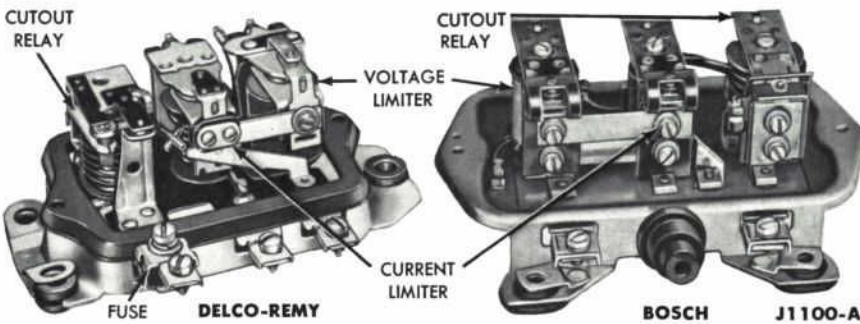


FIG. 10—Heavy Duty Generator Regulators—1961

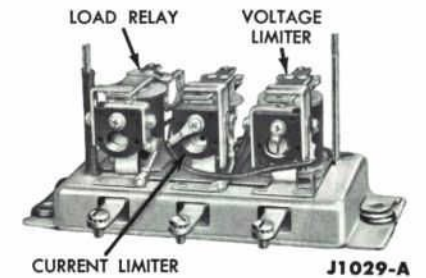


FIG. 11—Alternator Regulator—Typical

4 STARTERS

Ford built starters with a rubber inertia drive are used on the Galaxie and Thunderbird (Table 3). Ford built starters with a positive-action drive are used on Falcon, Fairlane and Econoline. No optional starters are used on these vehicles in regular production. Starter application is

listed in Table 3. Figures 12, 13, 14, and 15 show disassembled views of the starters.

Ford built starters are used as standard equipment on all light medium-duty trucks. The Autolite positive-action starter is optional on these trucks with a 6-cylinder engine

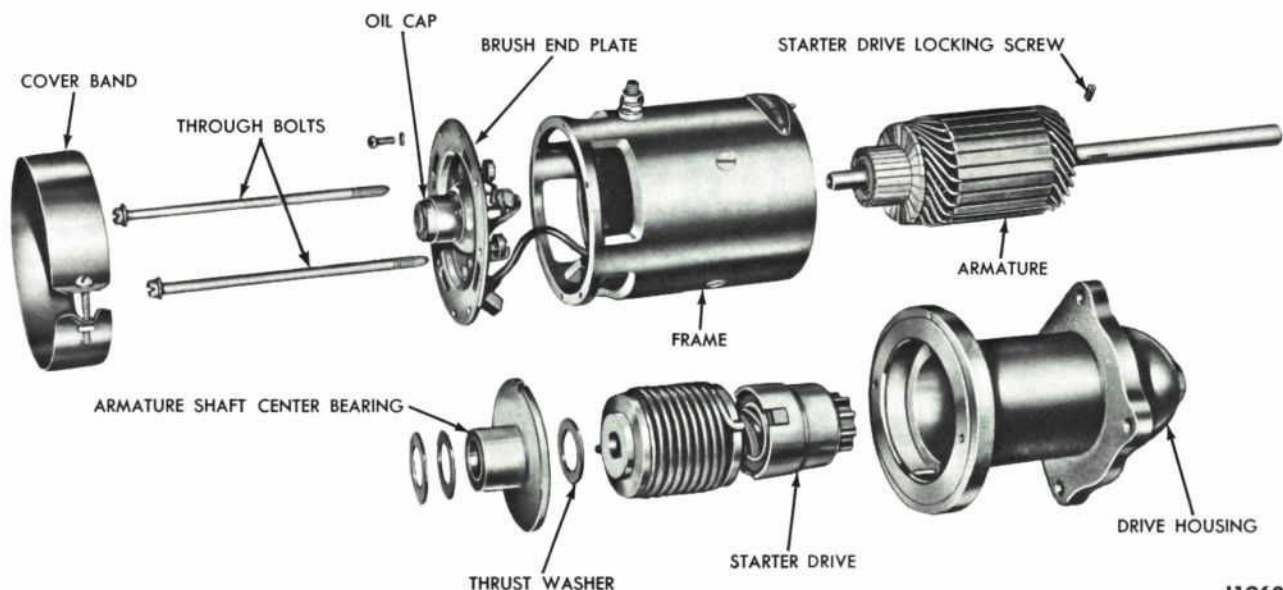
and the Delco positive-action starter is optional on these trucks with an 8-cylinder engine.

An Autolite or Delco-Remy starter with inertia drive is used on trucks with Super Duty engines.

A Leece-Neville 24-volt starter is used on the Cummins Diesel engine.

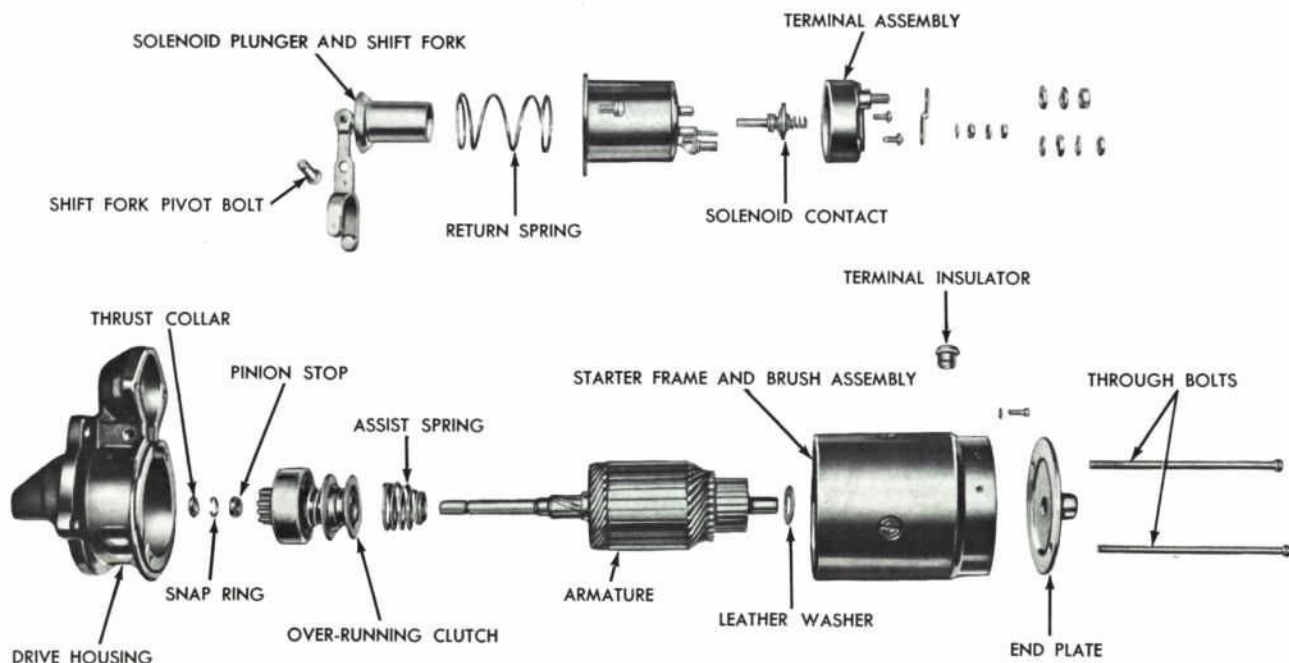
TABLE 3—1962 Starter Application

Manufacturer	Drive	Engine	Vehicle
STANDARD			
Ford	Folo-Thru	6 and 8-Cyl.	Galaxie, Thunderbird & Medium Duty Trucks
Ford	Positive-Action	6 and 8-Cyl.	Falcon, Fairlane, Econoline & Light Duty Trucks
Autolite	Folo-Thru	6-Cyl.	Medium Duty Trucks
Autolite	Inertia	Super Duty 8-Cyl.	Trucks
Leece-Neville	Inertia	Diesel (Cummins)	Trucks
OPTIONAL			
Delco	Positive-Action	8-Cyl.	Light Duty Trucks
Delco	Inertia	Super Duty 8-Cyl.	Trucks
Autolite	Positive-Action	6-Cyl.	Medium Duty Trucks



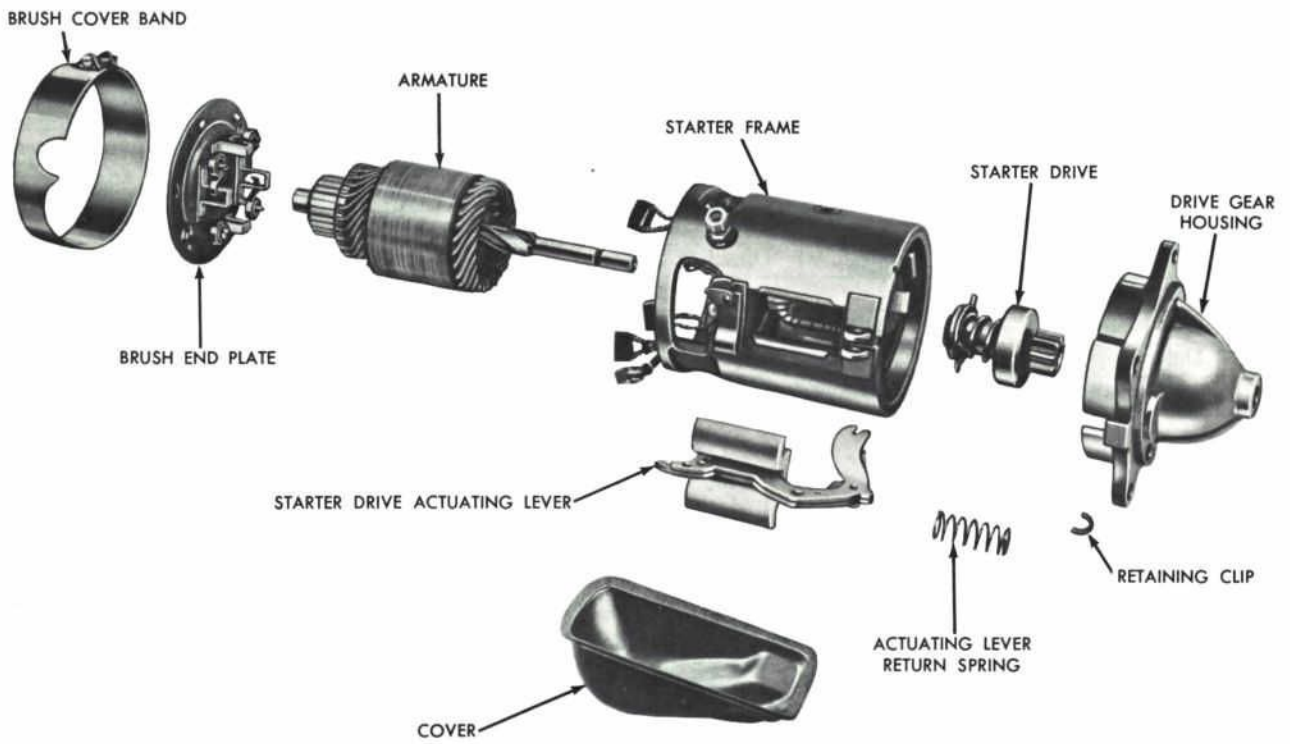
J1062-A

FIG. 12—Disassembled Autolite Starter



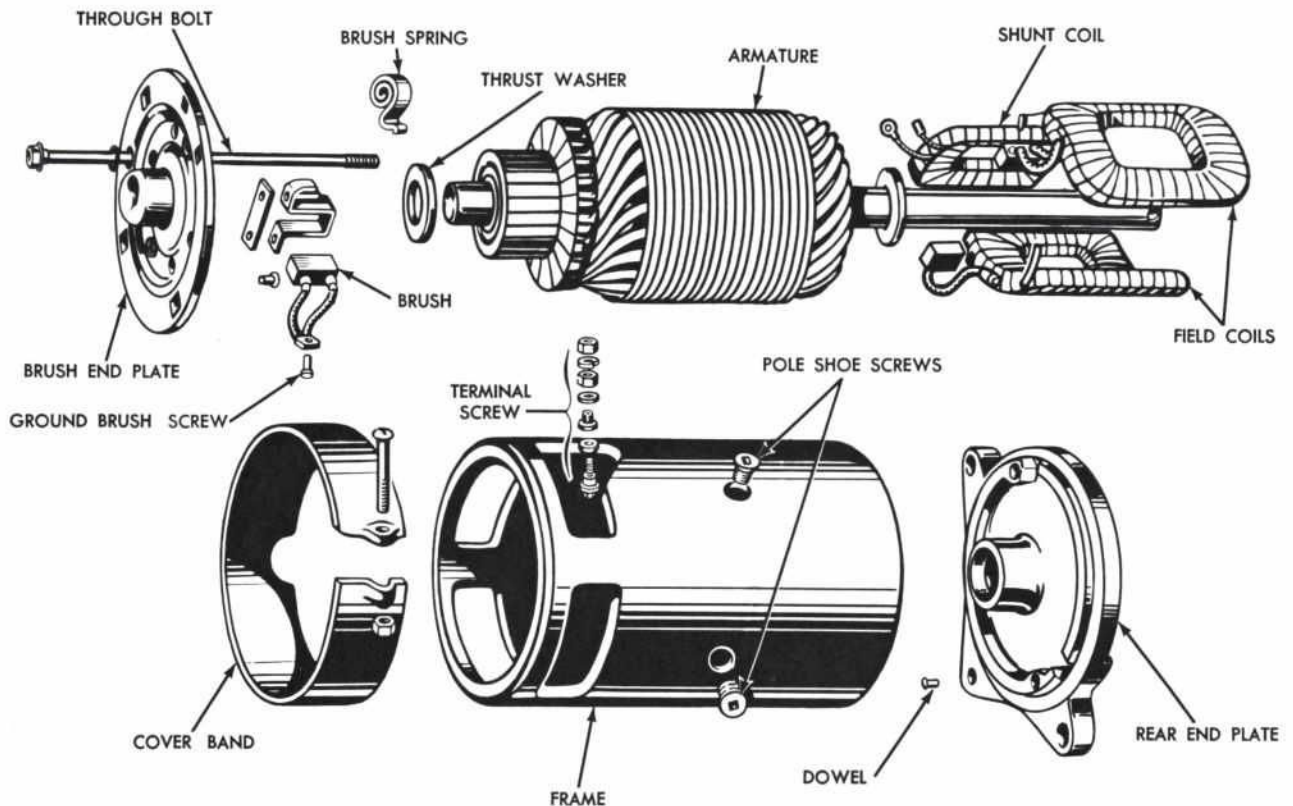
J1063-A

FIG. 13—Disassembled Delco Positive-Action Starter



J1089-A

FIG. 14—Disassembled Falcon and Econoline Starter



J1058-A

FIG. 15—Disassembled Ford Starter

PART 2

GENERATOR

1 REPLACEMENT

Typical generator mounting locations are shown in Figs. 16 and 17.

REMOVAL

1. Remove one cable from a battery terminal.
2. Disconnect the generator terminal wires. Note location and identify each wire for proper replacement.
3. Loosen the adjusting arm to generator bolt. Remove the generator belt, adjusting arm bolt and the two pivot bolts from the generator bracket. Then remove the generator.

INSTALLATION

1. Clean the mating surfaces of the generator frame and the mounting bracket.
2. Install the generator in the bracket with the two pivot bolts and

lock washers.

3. Install the generator belt, and the adjustment arm to generator bolt. Adjust the belt tension and torque all bolts to specifications.

4. If the generator is new or has been rebuilt it should be polarized by **momentarily** connecting a jumper wire between the positive battery terminal and the field terminal on

the generator, before connecting the generator leads. Polarization takes place instantly. The negative terminal of the battery must be connected to ground when polarizing the generator. Attach the wire leads on the proper generator terminals. Be sure that the battery cables are properly connected. Start the engine and check the generator operation.

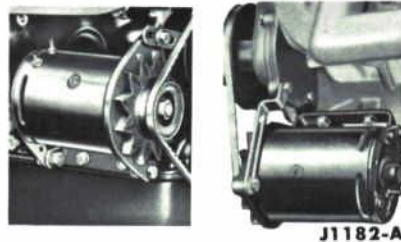


FIG. 16—Generator Mounting
—Typical Mileage Maker Six

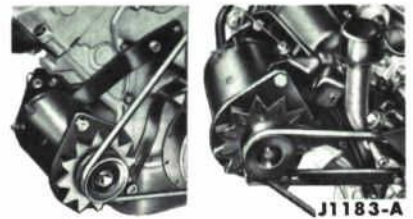


FIG. 17—Generator Mounting
—Typical V-8

2 OVERHAUL

Remove the generator from the vehicle following the procedure under "Generator Removal."

DISASSEMBLY

1. Remove the rubber splash boot if the generator is so equipped.
2. Remove the generator through bolts and the brush end plate.
3. Remove the brushes, brush arms and springs from the brush end plate.
4. Remove the front end plate and the armature assembly. Do not lose the front end plate locating dowel.
5. Clamp the armature in a vise equipped with soft jaws, and remove the pulley nut, lock washer, pulley and Woodruff key from the armature shaft. Use a standard gear puller to remove the pulley if it does not slide off the armature shaft.
6. Slide the front end plate off

the armature shaft. **Remove any burrs from the keyway before removing the front end plate.** Re-

move the bearing retainer and remove the bearing from the front end plate only if the bearing is loose or has lost its lubricant.

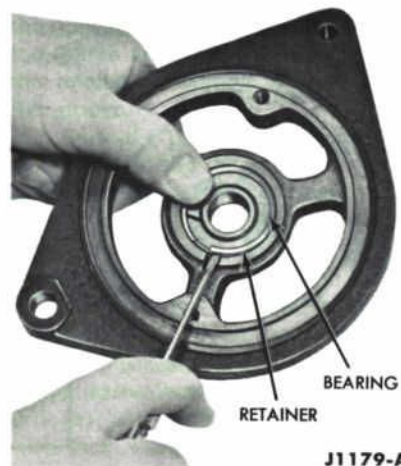


FIG. 18—Retainer Removal—A

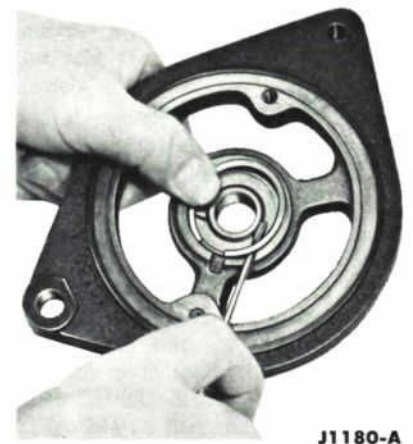


FIG. 19—Retainer Removal—B

To remove the bearing from the front end plate, position one end of the retainer in the end plate slot (Fig. 18). Push the end of the retainer out of the groove and lift it out of the bearing recess. Slide the screwdriver under the retainer and around the bearing recess (Fig. 19). Hold one side of the retainer to prevent it from springing away. Remove the bearing from the end plate.

7. Remove the field and ground terminal screws from the frame, and unscrew the field pole shoes as shown in Fig. 20.

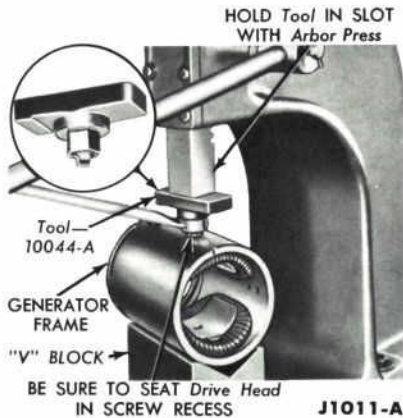


FIG. 20—Pole Shoe Screw Removal

8. Slide the pole shoes and field windings out of the frame, and separate the windings and shoes. Note the position and location of the coil leads for proper assembly.

CLEANING AND INSPECTION

1. Wash all parts except the armature, field coils, and ball bearings in solvent and dry the parts thoroughly.

2. Wipe off the field coils and the armature.

3. Check field and armature coils for indications of bad insulation, overheating or unsoldered connections. Resolder connections as required. Replace field coils or armature if the insulation is bad or there is an indication of overheating.

4. Check the armature coils for open circuits. An open circuit can sometimes be detected by examining the commutator for evidence of bad burning. A badly burned spot on the commutator is caused by an arc formed every time the commutator segment connected to the open circuit passes under the brush. When an open circuit is indicated, replace the armature.

5. Check the commutator for run-out and uneven or scored surfaces (Fig. 21). If the commutator is more than 0.002 inch out-of-round or uneven, turn down the commutator and undercut the mica if necessary. The armature must be replaced if the commutator is less than 1.540 inches in diameter.

6. Inspect the brush end plate for cracked or broken insulation or loose rivets. Replace the end plate if faults are detected.

7. Check the brush spring tension.

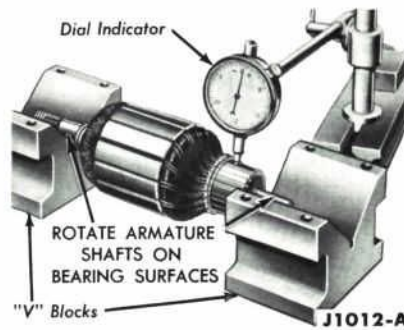


FIG. 21—Commutator Runout Check

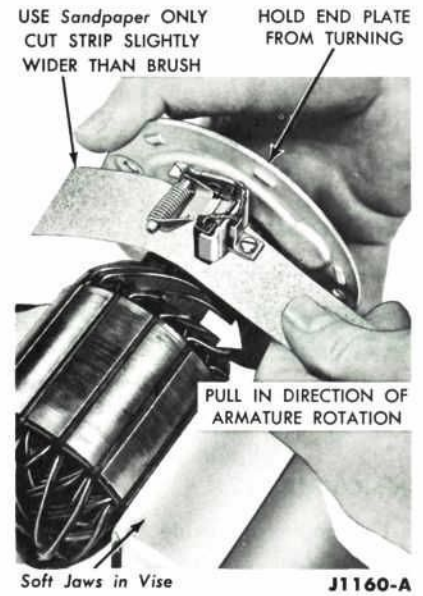


FIG. 22—Seating Generator Brushes

If the tension is not within specifications, replace the springs.

8. Replace the brushes if they are cracked, chipped or show excessive wear. Replace brushes less than $\frac{3}{8}$ inch long. Seat new brushes as shown in Fig. 22. Always replace brushes in pairs.

9. Inspect the inside of the frame for dirt or corrosion in the pole shoe contact area. Clean this area, if necessary, to provide a good magnetic contact between the pole shoes and the frame.

Check the inside of the frame for solder which may have been thrown from the commutator. A ring of solder around the inside of the frame is an indication that the commutator was overheated because of a misadjusted current limiter in the regulator.

10. Check the ball bearings for

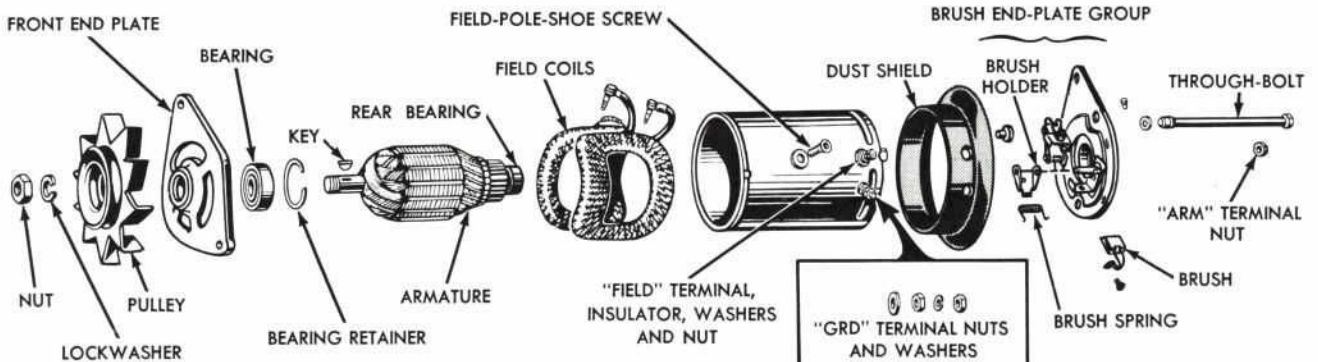
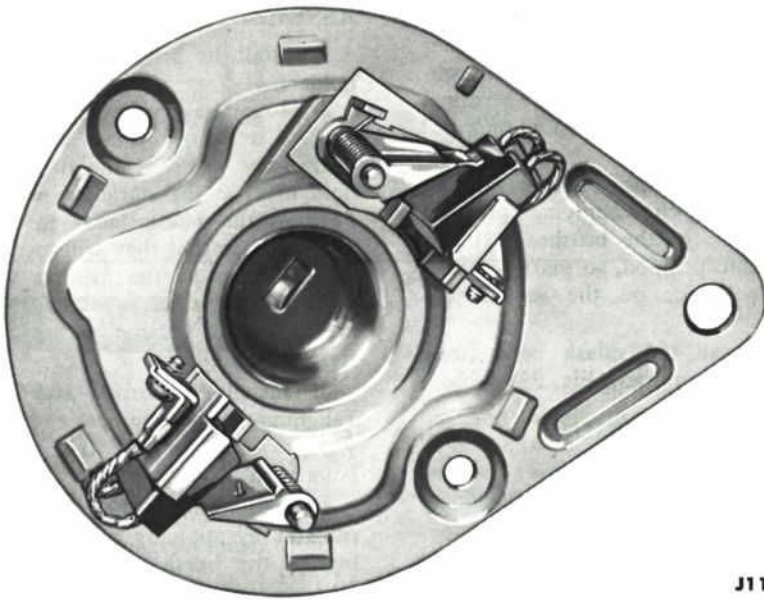


FIG. 23—Disassembled Generator—Typical



J1161-A

FIG. 24—Generator Brush Holders

wear or loss of lubricant. The ball bearings must be replaced if they are worn or have lost their lubricant. When replacing the bearing, apply pressure on the inner race only. The rear bearing is a part of the armature assembly. When replacing the armature, do not use the old rear bearing.

ASSEMBLY

1. Install the field coils on the pole shoes, and mount the shoe and coil assemblies in the frame. Make sure that the coils and coil leads are in the correct position for proper assembly.

2. Tighten the field pole shoe screws (Fig. 20). **As the screws are tightened, strike the frame several sharp blows with a soft faced hammer to seat and align the pole shoes. Stake the screws.**

3. Install the field and ground terminal screws, washers, and nuts, in the frame (Fig. 23).

4. Install the brush arms, springs, and brushes in the brush holders.

5. Move the brushes back in the holders until the brush arms ride against the side of the brushes to hold them in the retracted position. Position the brush leads in loops (Fig. 24) so that they will clear the brush holder as the brushes wear. The leads of the insulated brush must clear the frame to prevent a short in the circuit.

6. Install the bearing in the front



J1181-A

FIG. 25—Bearing Retainer Replacement

end plate and install the bearing retainer.

To replace the bearing retainer, seat one end in the groove and press the opposite side into the recess with the thumb (Fig. 25). Make sure that the retainer is completely seated in the groove.

7. Slide the plate on the armature shaft (with the bearing retainer toward the armature windings), and install the key, pulley, lock washer and retaining nut.

8. Install the armature and front end plate assembly in the frame, locating the dowel in the frame groove.

9. Install the brush end plate (aligning the locating boss and frame groove), and install the through bolts with lock washers.

If the vehicle is radio equipped, a suppressor condenser must be at-



J1173-A

FIG. 26—Generator Suppressor Condenser Installation

tached to the generator (Fig. 26). Make certain that all contact surfaces are clean. It is not necessary to remove the generator assembly bolt to install the generator condenser. Slide the mounting bracket under the lock washer. Connect the condenser lead to the armature terminal of the generator. Tighten all nuts and bolts securely.

10. Position the brushes on the commutator by applying pressure to the top of the brushes to move them in position so that the brush arm will ride on the top of the brush.

11. Install the splash boot (dust shield) if so equipped (Fig. 23).

ARMATURE REPLACEMENT

DISASSEMBLY

1. Remove the rubber splash boot if the generator is so equipped.

2. Remove the generator through bolts and the brush end plate.

3. Remove the brush end plate.

4. Remove the front end plate and the armature assembly. Do not lose the front end plate locating dowel.

5. Remove the pulley and front end plate from the armature. Remove the bearing from the end plate if the bearing is to be replaced.

ASSEMBLY

1. Move the brushes back in the holders until the brush arms ride against the sides of the brushes to hold them in the retracted position. Position the brush leads in loops (Fig. 24) so that they will clear the brush holder as the brushes wear. The leads of the insulated brush

must clear the frame to prevent a short in the circuit.

2. If necessary, install the bearing in the front end plate and install the bearing retainer.

3. Slide the plate on the armature shaft (with the bearing retainer toward the armature windings) and install the key, pulley, lock washer and retaining nut.

4. Install the armature and front end plate assembly in the frame, locating the dowel in the frame groove.

5. Install the brush end plate (aligning the locating boss and frame groove), and install the through bolts with lock washers.

If the vehicle is radio equipped, a suppressor condenser must be attached to the generator (Fig. 26). Make certain that all contact surfaces are clean. It is not necessary to remove the generator assembly bolt

to install the generator condenser. Slide the mounting bracket under the lock washer. Connect the condenser lead to the armature terminal of the generator. Tighten all nuts and bolts securely.

6. Position the brushes on the commutator by applying pressure to the top of the brushes to move them into position, so that the brush arm will ride on the top of the brush.

7. Install the splash boot (dust shield) if required (Fig. 23).

BRUSH REPLACEMENT

DISASSEMBLY

1. Remove the rubber splash boot if the generator is so equipped.

2. Remove the generator through bolts and the brush end plate.

3. Remove the brushes, brush arms and springs from the brush end plate and clean and check all parts.

ASSEMBLY

1. Install the brushes in the brush holders.

2. Move the brushes back in the holders until the brush arms ride against the sides of the brushes to hold them in the retracted position. Position the brush leads in loops (Fig. 24) so that they will clear the brush holder as the brushes wear. The leads of the insulated brush must clear the frame to prevent a short in the circuit.

3. Install the brush end plate (aligning the locating boss and frame groove), and install the through bolts with lock washers.

4. Position the brushes on the commutator by applying pressure to the top of the brushes to move them into position, so that the brush arm will ride on top of the brush.

5. Install the splash boot (dust shield) if so equipped (Fig. 23).

PART 3

ALTERNATORS

1 REPLACEMENT

REMOVAL

1. Remove a battery cable from the battery terminal. Disconnect the wires at the alternator terminals. Note the location and identify the wires for proper replacement.

2. Remove the adjustment arm to alternator bolt, the alternator belt, and the two pivot bolts from the mounting bracket. Then remove the alternator (Figs. 27 and 28).

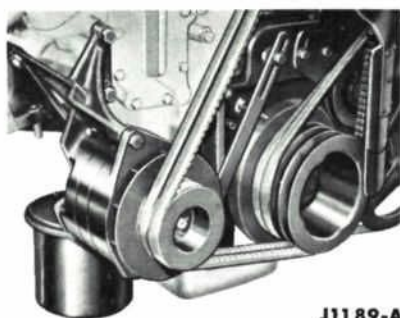
INSTALLATION

1. To install the alternator, clean the mating surfaces of the alternator frame and mounting bracket.

2. Install the alternator in the bracket with the two pivot bolts and lock washers.

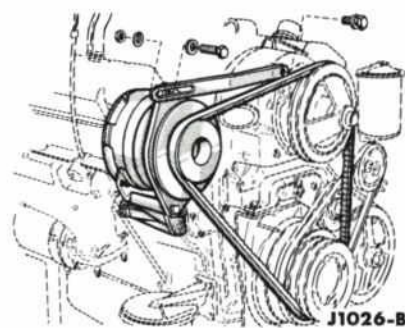
3. Install the alternator belt, and the adjustment arm to alternator bolt. Adjust the belt tension to specifications and torque all bolts to specifications.

4. Connect the wire leads on the alternator terminals. Install the battery cable on the battery terminal. Start the engine and check the alternator operation.



J1189-A

FIG. 27—Typical Car and Light Truck Alternator Mounting



J1026-B

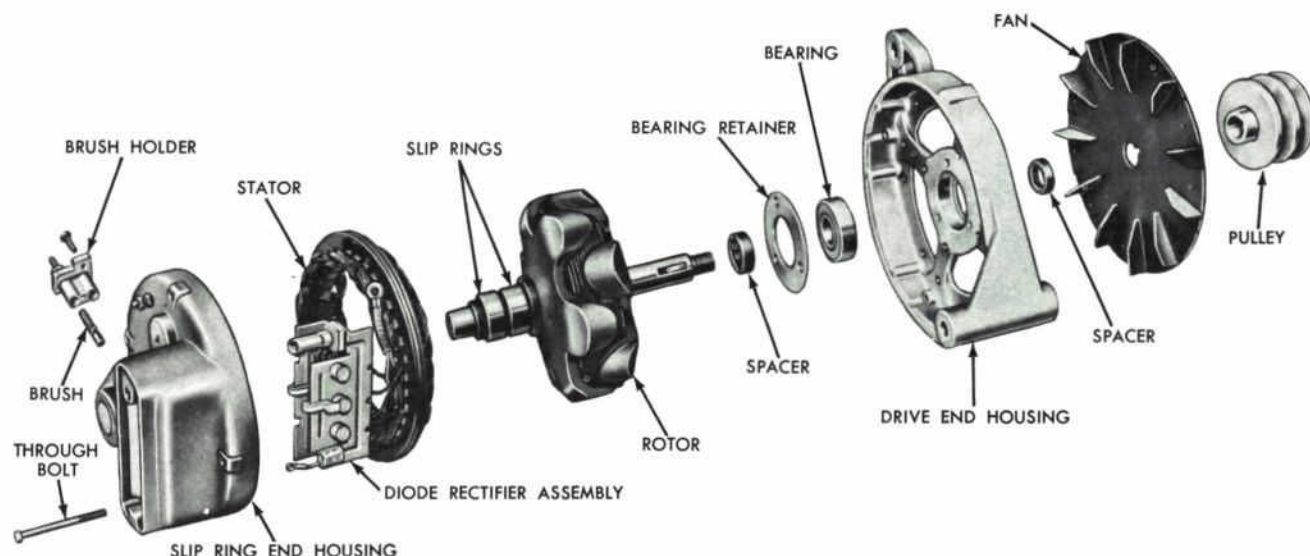
FIG. 28—Typical Heavy Duty Truck Alternator Mounting

2 40 AMPERE ALTERNATOR

A disassembled view of the 40 ampere alternator is shown in Fig.

29. Service which requires the replacement of parts on the 40 ampere

Leece-Neville alternator should be referred to the Leece-Neville distributor.



J1124-A

FIG. 29—Disassembled 40 Ampere Alternator

3 OVERHAUL—60 AMPERE CAR ALTERNATOR

A disassembled view of the 60 ampere Leece-Neville car alternator is shown in Fig. 30.

DISASSEMBLY

1. Remove the shaft nut and washer, remove the pulley with a gear puller, and remove the fan, key and spacer.

2. Remove the nuts, lock washers and insulator from the three AC terminals.

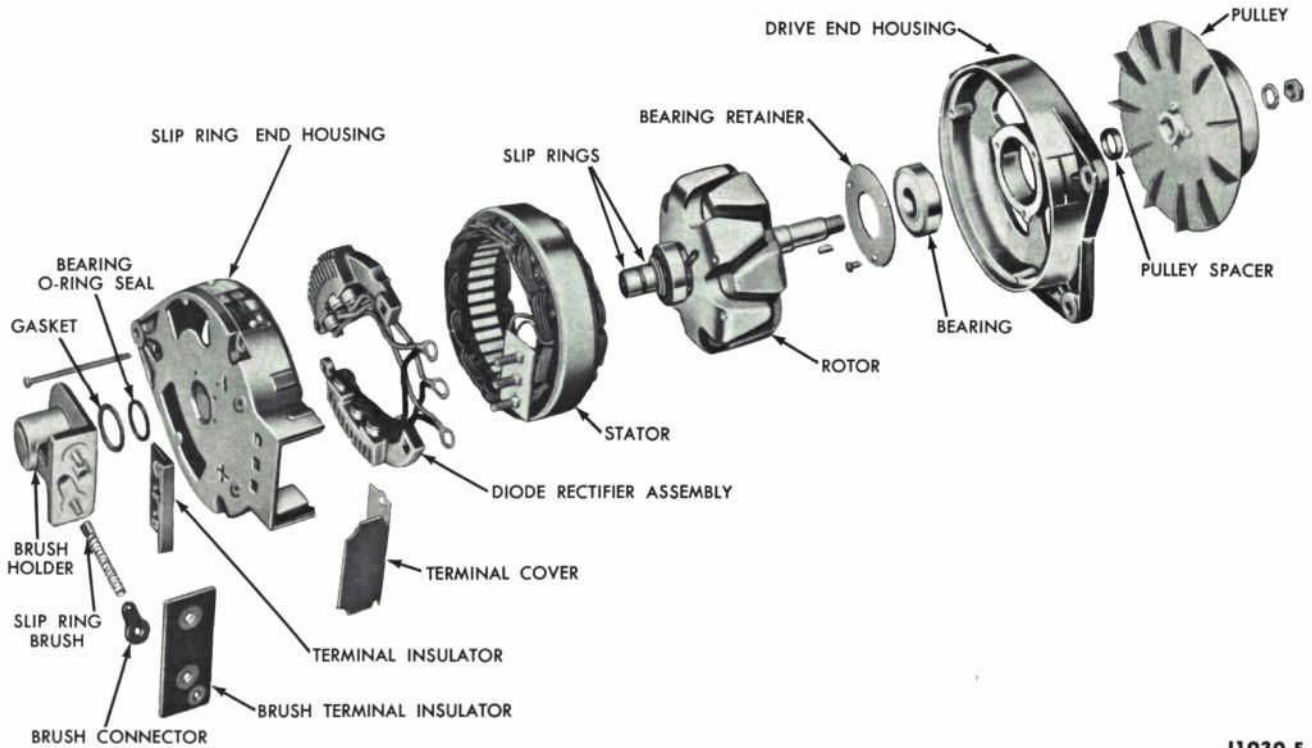
3. Remove the three end-housing screws. Remove the terminal end housing.

4. Remove the brush holder assembly from the slip-ring end housing,

and remove the brushes.

5. Pull the slip-ring end housing and stator assembly from the alternator using a gear puller. Remove the stator from the slip-ring end housing.

6. Remove the rotor from the drive-end housing using a gear puller



J1030-E

FIG. 30—Disassembled 60 Ampere Car Alternator

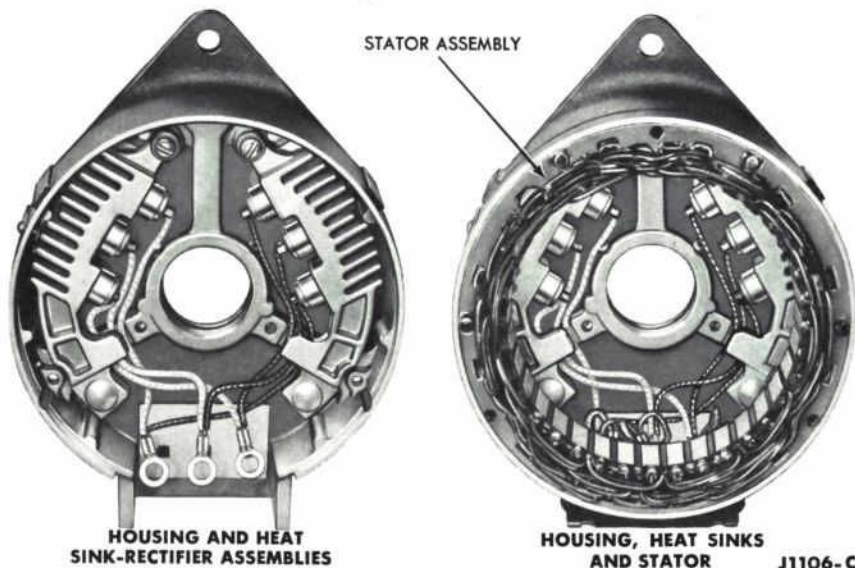


FIG. 31—Car 60 Ampere Slip-Ring End Housing, Rectifier, and Stator Assembly

or an arbor press. If the bearing is loose or has lost its lubricant, remove the slip rings and the bearing from the slip-ring end of the rotor shaft. Use a gear puller. Use care in removing the slip rings, so as not to damage them. If they are cracked or broken during disassembly, they must be replaced.

7. Remove the bearing retainer from the drive-end housing and press out the old bearing from the housing. Remove the bearing only if the bearing is loose or has lost its lubricant.

8. Remove the rectifier assembly mounting bolts, terminals, and insulators and remove the rectifier assemblies.

CLEANING AND INSPECTION

Wash all parts except the rotor,

the stator, the rectifier assemblies, and the bearings, in solvent and dry the parts thoroughly. Wipe off the rotor and shaft, the bearings, the stator, and the rectifier assemblies.

Check the condition of the bearings. If the bearings are worn or have lost their lubricant, they must be replaced.

Check the rotor and stator windings for worn insulation, overheating, and unsoldered connections. Resolder any connections as required. Replace the stator or rotor if the insulation is defective.

Check the slip rings for runout with a dial indicator, and check for uneven or scored surfaces. If the runout is greater than 0.002 inch, take a light cut from the face of the slip ring assembly.

Check the insulation on the brush holder assembly and the stator terminals. If it is cracked or burned, replace the insulation.

ASSEMBLY

1. Press the new bearing onto the slip ring end of the rotor shaft. **Put pressure on the inner race only.**

Heat the slip rings so that the insulation will not split, carefully press the slip rings on the shaft, and solder the field wires to the rings.

2. Press the new bearing into the drive-end housing, and install the bearing retainer. **Put pressure on the outer race only.**

3. Place the slip-ring end of the shaft firmly on a flat plate in an arbor press, and assemble the drive-end housing and bearing on to the drive end of the shaft. **Use a tube or pipe to put pressure on the bearing inner race only.**

4. Put the rectifier insulators in position. Examine each one for cracks or chips. Place the rectifier assemblies in the housing and install the mounting screws and terminals (Fig. 31). Make certain that the rectifier assemblies are insulated from the end frame.

5. Put a new bearing O-ring seal in the slip-ring end housing, place the stator in position (Fig. 31), and line up the end-housing screw holes to match those in the stator. Position the three stator terminals over the

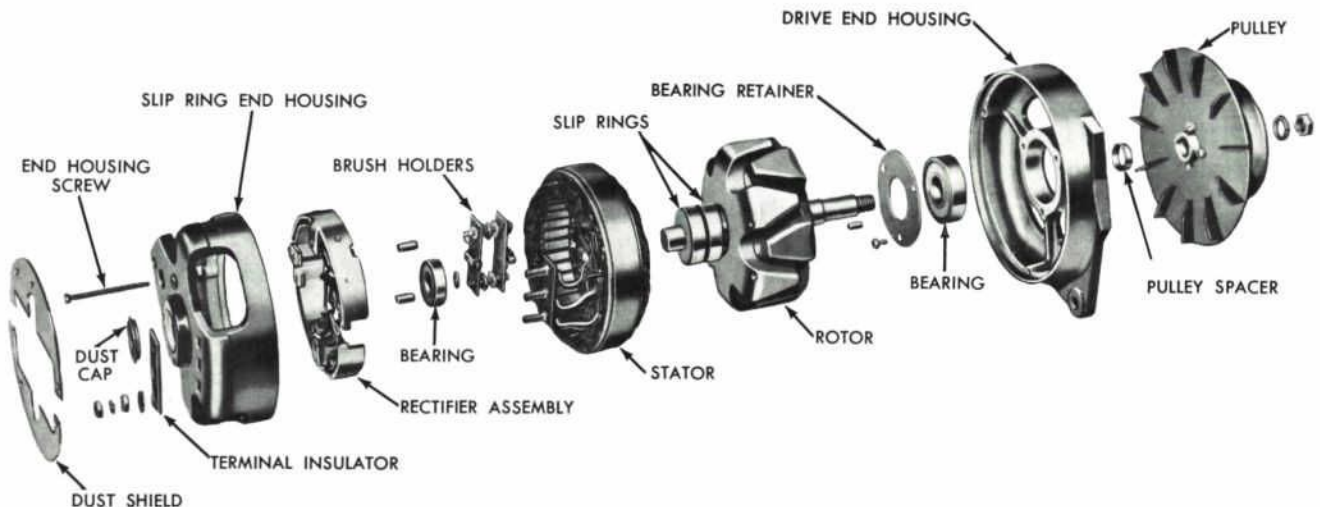
three rectifier terminals, place the insulators in position and install the AC terminal bolts.

6. Place the slip-ring end housing and stator assembly into position over the rotor. Use the end-housing screws to line up the two housings and the stator. Using a tube or pipe over the slip rings, apply pressure to the center of the slip-ring end housing in the arbor press. Tighten the end-housing screws.

7. Install the brush holder with the O-ring between the holder and the frame (Fig. 30). Place the brushes and springs in the holder with the extruded portion of the brush connectors against the terminal screw shoulders. Hold the brush connectors in position with a "U" shaped spring clip until the terminal insulator is installed. Install the brush terminal insulator.

8. Use a spacer that will provide 1/16 inch clearance between the fan fins and the drive-end housing. Install the pulley spacer, key, pulley, lock washer and nut. Torque the pulley nut to 40 ft-lbs.

4 OVERHAUL—60 AMPERE TRUCK ALTERNATOR



J1190-A

FIG. 32—Disassembled 60 Ampere Truck Alternator

A disassembled view of the truck 60 ampere Leece-Neville alternator is shown in Fig. 32.

DISASSEMBLY

1. Remove the pulley nut and washer. Remove the pulley with a

gear puller, and remove the key and spacer.

2. Remove the dust shields. Remove the three end-housing screws. Pry the bearing dust cap out of the slip-ring end housing.

3. Pull the slip-ring end housing from the alternator assembly using a gear puller. At the same time pry the stator from the drive-end housing and remove the slip-ring end housing and stator together.

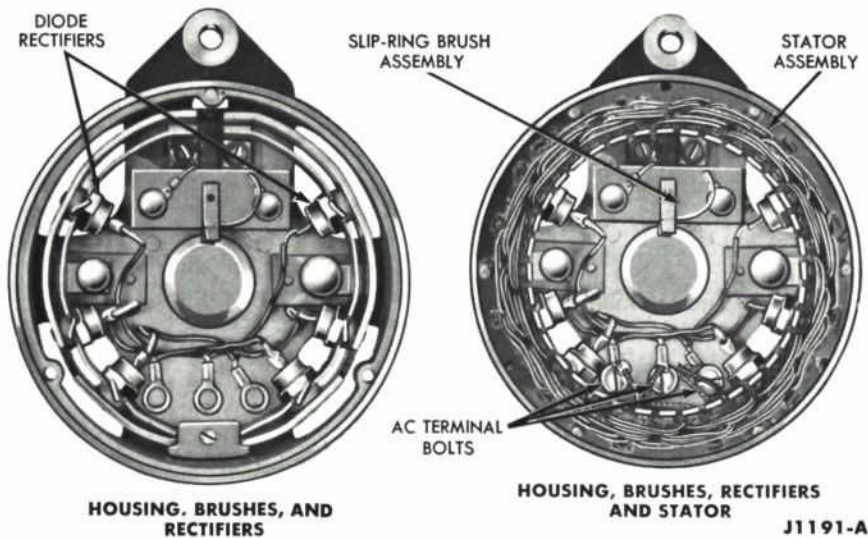


FIG. 33—60 Ampere Truck Slip-Ring End Housing, Rectifier and Stator Assembly

4. Remove the rotor from the drive-end housing, using a gear puller or an arbor press. Remove the bearing from the slip-ring end of the rotor shaft, only if the bearing is loose or has lost its lubricant. Use a gear puller.

5. Remove the bearing retainer from the drive-end housing and press out the old bearing from the housing, only if the bearing is loose or has lost its lubricant.

6. Remove the nuts, lock washers and insulator from the three AC terminals. Remove the three AC terminal bolts and remove the stator from the slip-ring end housing.

7. Remove the rectifier assembly mounting bolts, terminals, and insulators and remove the rectifier assembly.

CLEANING AND INSPECTION

Wash all parts except the rotor, the stator and the bearings, in solvent, and dry the parts thoroughly. Wipe off the rotor and shaft, the bearings and the stator.

Check the condition of the bearings. If the bearings are worn or have lost their lubricant, they must be replaced.

Check the rotor and the stator windings for worn insulation, overheating, and unsoldered connections. Resolder any connections as required. Replace the stator or rotor if the insulation is defective.

Check the slip rings for runout with a dial indicator, and check for

uneven or scored surfaces. If the runout is greater than 0.002 inch take a light cut from the face of the slip-ring assembly.

Check the insulation on the brush holder assemblies and the stator terminals. If it is cracked or burned, replace the insulation.

ASSEMBLY

1. Press the new bearing into the slip-ring end housing. **Put pressure on the outer race only.**

2. Press the new bearing into the drive-end housing, and install the bearing retainer. **Put pressure on the outer race only.**

3. Place the slip-ring end of the shaft firmly on a flat plate in an arbor press, and assemble the drive-end housing and bearing on to the drive end of the shaft. **Use a tube or pipe so as to put pressure on the bearing inner race only.**

4. Install the brush holder assemblies in the order shown in Figs. 32 and 33. Make certain that both terminals are insulated from ground.

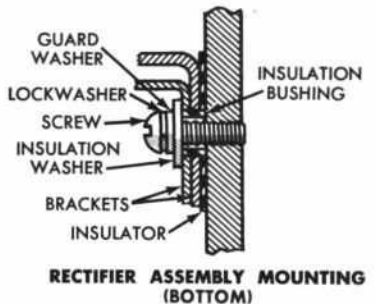
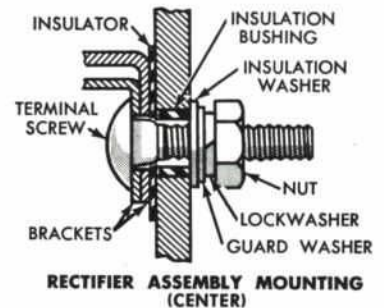
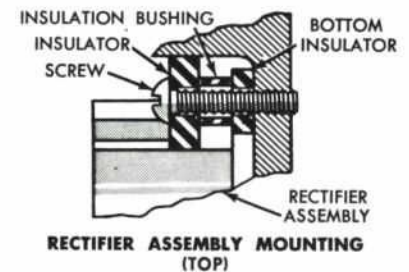
5. Put the rectifier insulators in position (Fig. 34). Place the rectifier assembly in the housing and install the mounting screws and terminals (Fig. 33). Make certain that the rectifier assembly is insulated from the end frame.

6. Place the stator in position (Fig.

33), and line up the end-housing screw holes to match those in the slip-ring end-housing. Position the three stator terminals over the three rectifier terminals and install the AC terminal bolts (Fig. 33).

7. Place the slip-ring end housing and stator assembly into position over the rotor. Use the end-housing screws to line up the two housings and the stator. Reach through the slip-ring end housing openings and retract each slip-ring brush with a hooked wire as the slip rings come into position. Apply pressure to the center of the slip-ring end housing in an arbor press. Tighten the end housing screws.

8. Use a spacer that will provide 1/16 inch clearance between the fan fins and the drive-end housing. Install the pulley spacer, key, pulley, lock washer and nut. Torque the mounting nut to 40 ft-lbs. Install the dust shields.



J1172-A

FIG. 34—60 Ampere Truck Alternator Insulators

PART 4

REGULATOR REPLACEMENT

The various regulators used on Ford cars and trucks are illustrated in Figs. 35 thru 43.

To remove the regulator, first, remove a battery cable from the battery terminal. Disconnect the armature, field, and battery leads at the regulator terminals. Remove the mounting screws and the regulator.

To install the regulator, place it in position and install the mounting screws. Mount the ground wire terminal and the radio suppression condenser under a regulator mounting

screw. Connect the armature, field, battery, and radio suppression condenser leads to the regulator terminals. Connect the battery cable.

The generator regulator must be replaced if it cannot be adjusted. No provisions are made for replacing the parts.

The alternator regulator is serviced as a unit. Although service kits are available for replacement of certain alternator regulator parts, rebuilding the regulator should be left to the specialist.

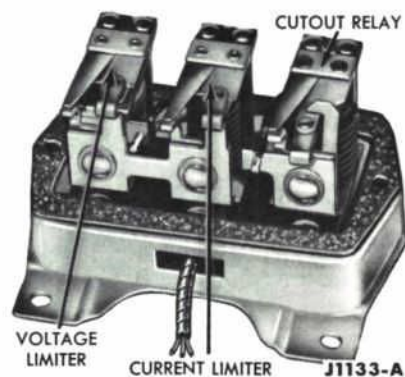


FIG. 35—Thunderbird Generator Regulator

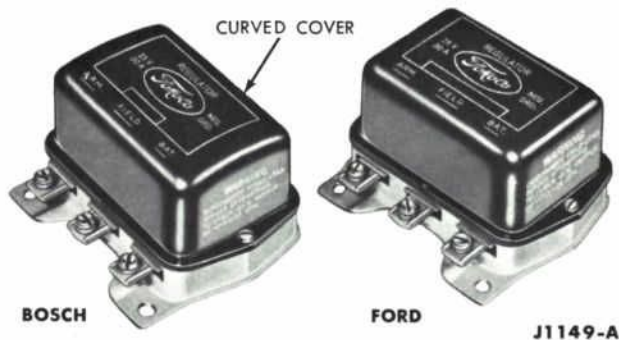


FIG. 36—Standard 30 Ampere Regulators

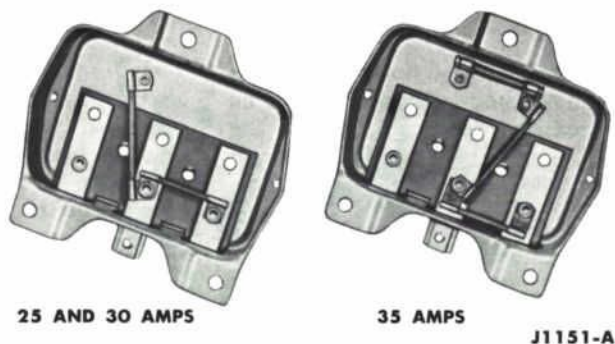


FIG. 37—Ford Generator Regulators—Bottom View

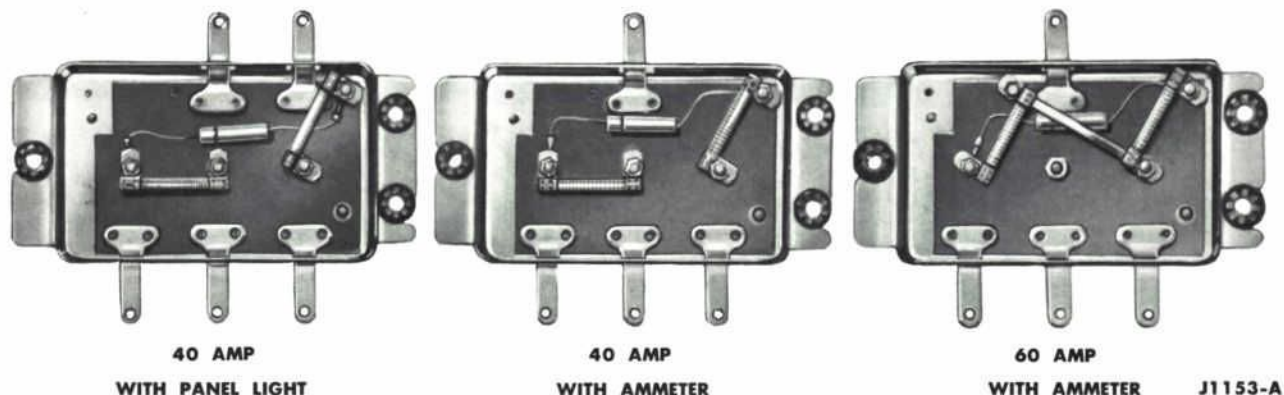


FIG. 38—Alternator Regulators—Bottom View

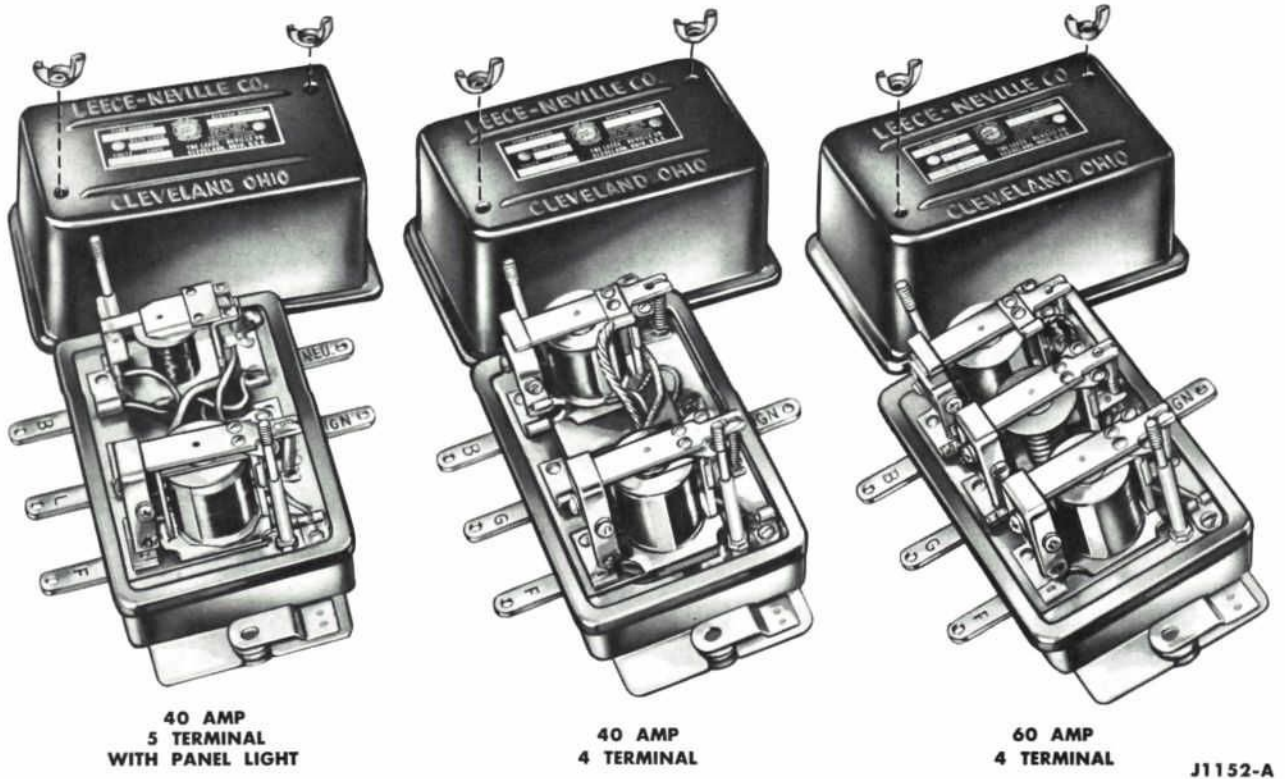


FIG. 39—Alternator Regulators—Top View

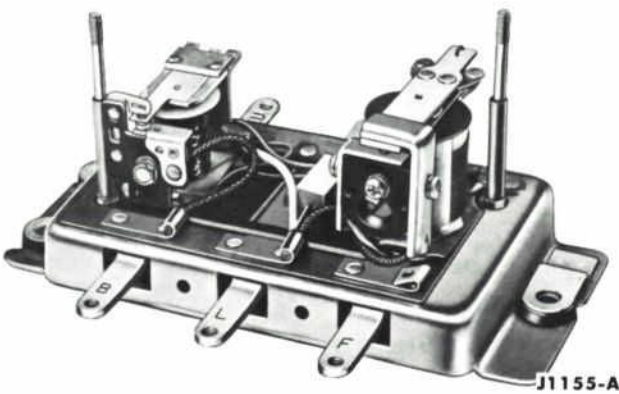


FIG. 40—5 Terminal Regulator—Front View

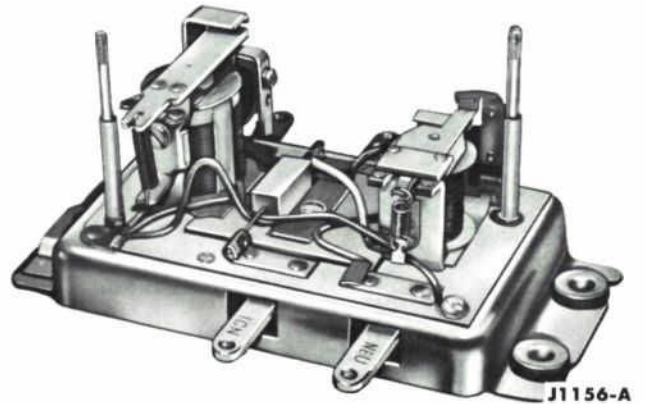


FIG. 41—5 Terminal Regulator—Rear View

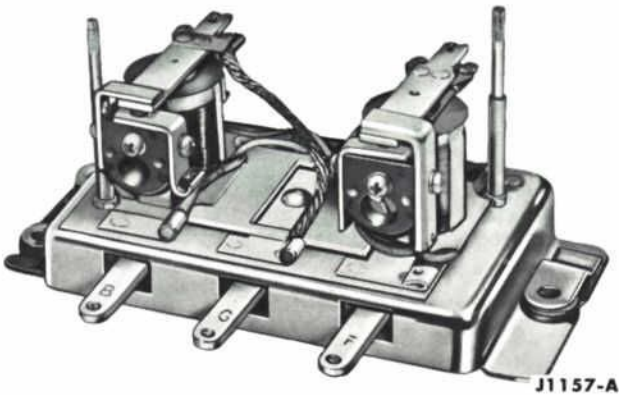


FIG. 42—40 Ampere Regulator—Front View

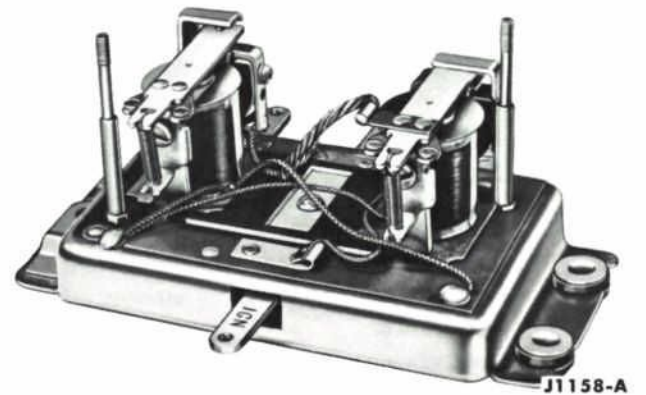


FIG. 43—40 Ampere Regulator—Rear View

PART 5

STARTERS

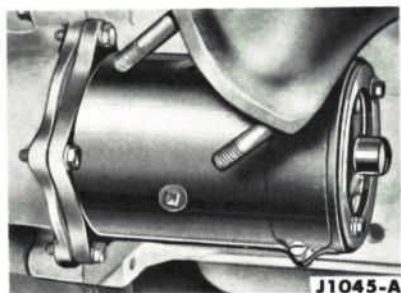


FIG. 44—Typical Starter Mounting—V-8

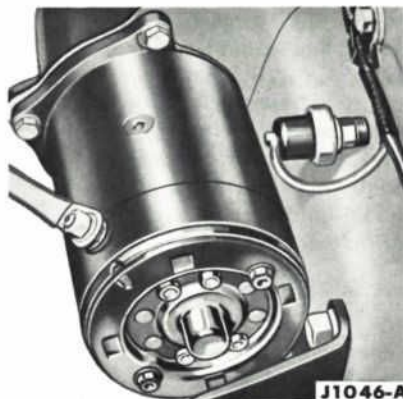


FIG. 45—Typical Starter Mounting—Mileage Maker Six

1 REPLACEMENT

Typical starter mountings are shown in Figs. 44 and 45.

REMOVAL

When the crankcase ventilation tube is mounted on the right side of the engine, remove the crankcase ventilation tube first.

1. Disconnect the starter cable at the starter terminal, remove the clutch housing to starter screws, then remove the starter assembly. **It may be necessary to tilt the starter slightly to clear the starter drive around the flywheel.** On High Per-

formance engines, remove the right hand exhaust manifold first. Trucks using an Autolite starter have a heat shield that is mounted under the starter mounting bolt and the outer rear stud on the exhaust pipe flange.

2. Transfer or replace the starter drive.

INSTALLATION

When installing the starter, assemble the motor to the engine. Install the crankcase ventilation tube if removed. Install the clutch hous-

ing to starter screws. On a car with an automatic transmission, the transmission dipstick tube bracket is mounted under the starter side mounting bolt. Snug all bolts, then torque to 15 to 20 ft-lbs, tightening the middle bolt first. Connect the starter cable.

On V-8 engines and the Falcon, make certain that the rubber seal is properly positioned before mounting the starter. If trouble is encountered in keeping the seal in position, apply rubber cement to both the seal and the engine block to hold the seal in position while mounting the starter.

2 STARTER OVERHAUL—FALCON AND ECONOLINE

Figure 46 illustrates the starter completely disassembled.

DISASSEMBLY

1. Loosen the brush cover band retaining screw and remove the brush cover band and the starter drive actuating lever cover.

2. Remove the through bolts, starter drive gear housing, and starter drive actuating lever return spring.

3. Remove the pivot pin retaining

the starter gear actuating lever and remove the lever.

4. Remove the armature.

5. Remove and discard the spring clip retaining the starter drive gear to the end of the armature shaft, and remove the starter drive gear assembly.

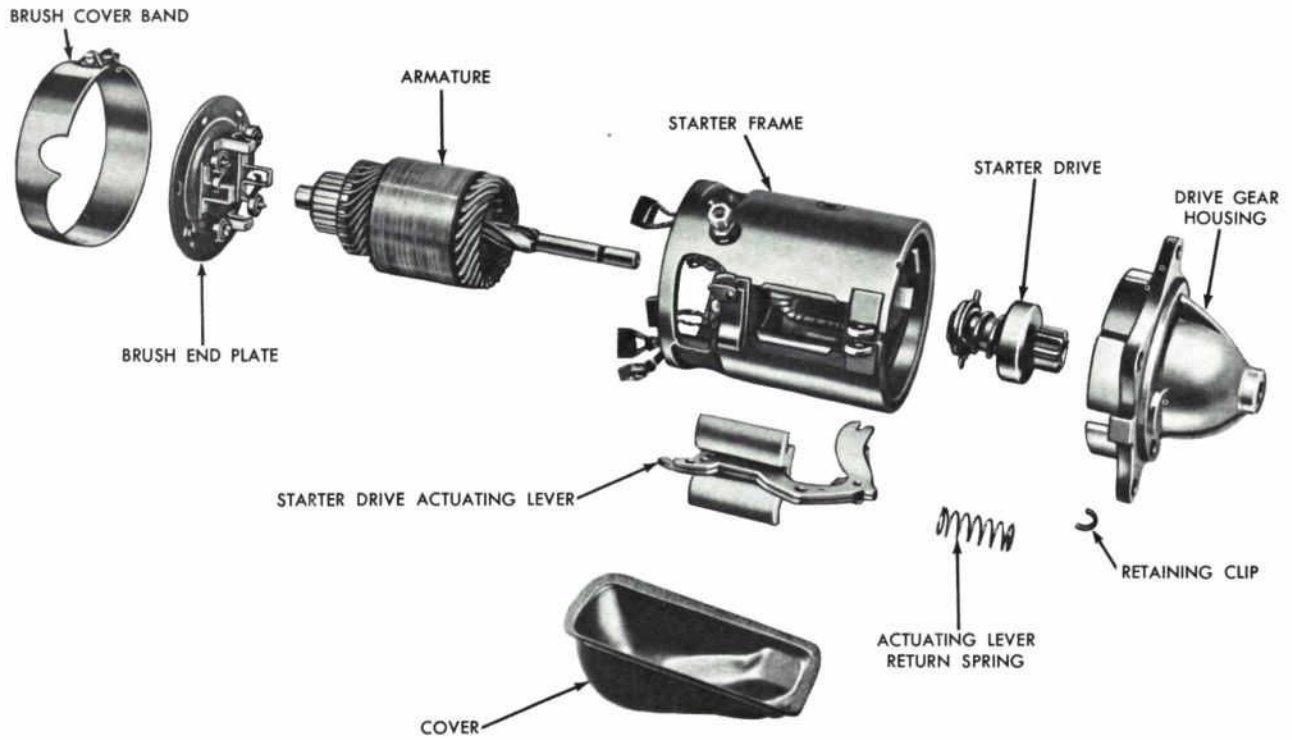
6. Remove the commutator brushes from the brush holders and remove the brush end plate.

7. Remove the two screws retain-

ing the ground brushes to the frame.

8. On the field coil that operates the starter drive gear actuating lever, bend the tab up on the field retainer and remove the field coil retainer.

9. Remove the three coil retaining screws, using tool 10044-A and an arbor press (Fig. 47). The arbor press prevents the wrench from slipping out of the screw. Unsolder the field coil leads from the terminal screw, and remove the pole shoes



J1089-A

FIG. 46—Falcon and Econoline Starter Disassembled

and coils from the frame.

10. Remove the starter terminal nut, washer, insulator, and terminal from the starter frame. Remove any excess solder from the terminal slot.

CLEANING AND INSPECTION

1. Wipe the field coils, armature, armature shaft, and drive with a clean cloth. Wash all other parts in

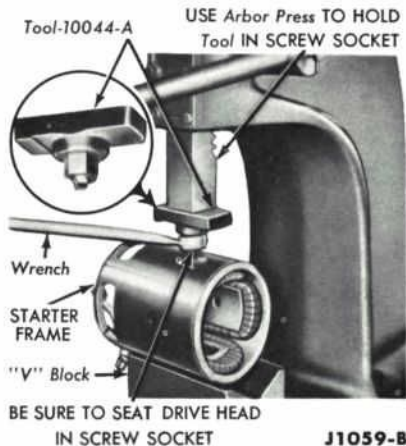


FIG. 47—Pole Shoe Screw Removal

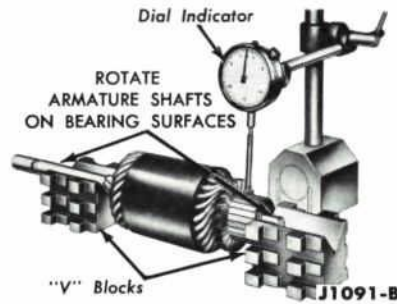


FIG. 48—Commutator Runout Check

- solvent and dry the parts.
- 2. Check the field coils for continuity. Check the armature for grounds and open circuits.
- 3. Check the commutator runout (Fig. 48) and, if necessary, turn down the commutator.
- 4. Inspect the armature shaft and bearings for scoring and excessive wear.
- 5. Check the brush holders for broken springs and the insulated brush holders for shorts to ground.
- 6. Check the brush spring tension.

It should be 48-56 ounces. Replace the springs if the tension is not within limits.

ASSEMBLY

1. Install the starter terminal, insulator, washers, and retaining nut in

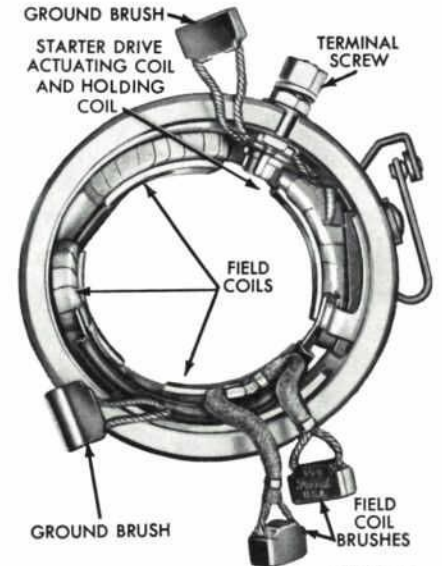


FIG. 49—Field Coil Assembly

the frame (Fig. 49). Be sure to position the slot in the screw perpendicular to the frame end surface.

2. Position the coils and pole pieces, with the coil leads in the terminal screw slot, and then install the retaining screws. As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes, then stake the screws.

3. Install the solenoid coil retainer and bend the tabs to retain the coil to the frame.

4. Solder the field coil to the starter terminal. Use a 300-watt iron.

5. Check for continuity and grounds in the assembled coils.

6. Solder the two brushes to the field coils.

7. Position the ground brushes to the starter frame and install the retaining screws.

8. Position the starter brush end plate to the frame, with the end plate boss in the frame slot.

9. Install the starter motor drive gear assembly to the armature shaft and install a new retaining spring clip.

10. Position the fiber thrust washer on the commutator end of the armature shaft and position in the starter pivot pin.

11. Position the drive gear actuating lever to the frame and install the pivot pin.

12. Position the starter drive actuating lever return spring and the drive gear housing to the frame and install the through bolts. **Do not pinch the brush leads between the brush plate and the frame.**

13. Install the brushes in the brush holders. **Be sure to center the brush springs on the brushes.**

14. Position the drive gear actuating lever cover on the starter and install the brush cover band and gasket. Tighten the band retaining screw.

15. Check the starter no-load current draw.

ARMATURE REPLACEMENT

1. Loosen the brush cover band retaining screw and remove the brush cover band and the starter drive actuating lever cover (Fig. 46).

2. Remove the through bolts, starter drive gear housing, and the starter drive actuating lever return spring.

3. Remove the pivot pin retaining the starter gear actuating lever and remove the lever.

4. Remove the armature. If it is necessary to remove the starter drive gear assembly, remove the spring clip from the end of the armature shaft and remove the assembly.

5. Replace the starter drive gear assembly and retaining clip, if removed.

6. Before installing the armature, remove the brushes from their holders.

7. Install the washer on the commutator end of the armature shaft and install the armature.

8. Position the starter gear actuating lever to the frame and drive gear assembly and install the retaining pivot pin.

9. Position the starter drive actuating lever return spring, starter drive gear housing, and brush plate to the starter frame, and then install the through bolts.

10. Place the brushes in their holders, and center the brush springs on the brushes.

11. Position the actuating lever cover and brush cover band, and then tighten the retaining screw.

COMMUTATOR TURNING

Check the commutator runout as shown in Fig. 48. If the surface of the commutator is rough or more than 0.002 inch out-of-round, turn it down.

BRUSH REPLACEMENT

Replace the starter brushes when they are worn to half size. Always

install a complete set of new brushes.

1. Loosen and remove the brush cover band and starter drive actuating lever cover.

2. Remove the two through bolts from the starter frame.

3. Remove the drive gear housing, and the actuating lever return spring.

4. Remove the starter drive actuating lever pivot retaining pin and lever, and remove the armature.

5. Remove the brushes from the brush holders and remove the brush end plate.

6. Remove the ground brush retaining screws from the frame and remove the brushes (cut the ground brush nearest the starter terminal) from the terminal block.

7. Unsolder the brush leads from the field coils.

8. Clean and inspect the starter motor.

9. Replace the brush end plate if the insulation between the field holder brush and the end plate is cracked or broken.

10. Solder the new field brushes to the field coils. Use a 300-watt iron.

11. Install the ground brush leads to the frame with the retaining screws.

12. Clean the commutator with #00 or #000 sandpaper.

13. Position the brush end plate to the starter frame, with the end plate boss in the frame slot.

14. Position the fiber washer on the commutator end of the armature shaft and install the armature in the starter frame.

15. Install the drive gear actuating lever to the starter with the pivot pin.

16. Position the return spring on the actuating lever and the drive gear housing to the starter frame. Install the through bolts.

17. Install the commutator brushes in the brush holders. Center the brush springs on the brushes.

18. Position the actuating lever cover and install the brush cover band and gasket.

3 STARTER OVERHAUL—CAR AND LIGHT TRUCK

DISASSEMBLY

1. Remove the starter drive (as explained in starter drive removal), through bolts, and rear end plate (Fig. 50). **Be sure to remove all burrs from the shaft to prevent scoring the rear end plate bushing.**

2. Remove the armature, two thrust washers, and remove the cover band.

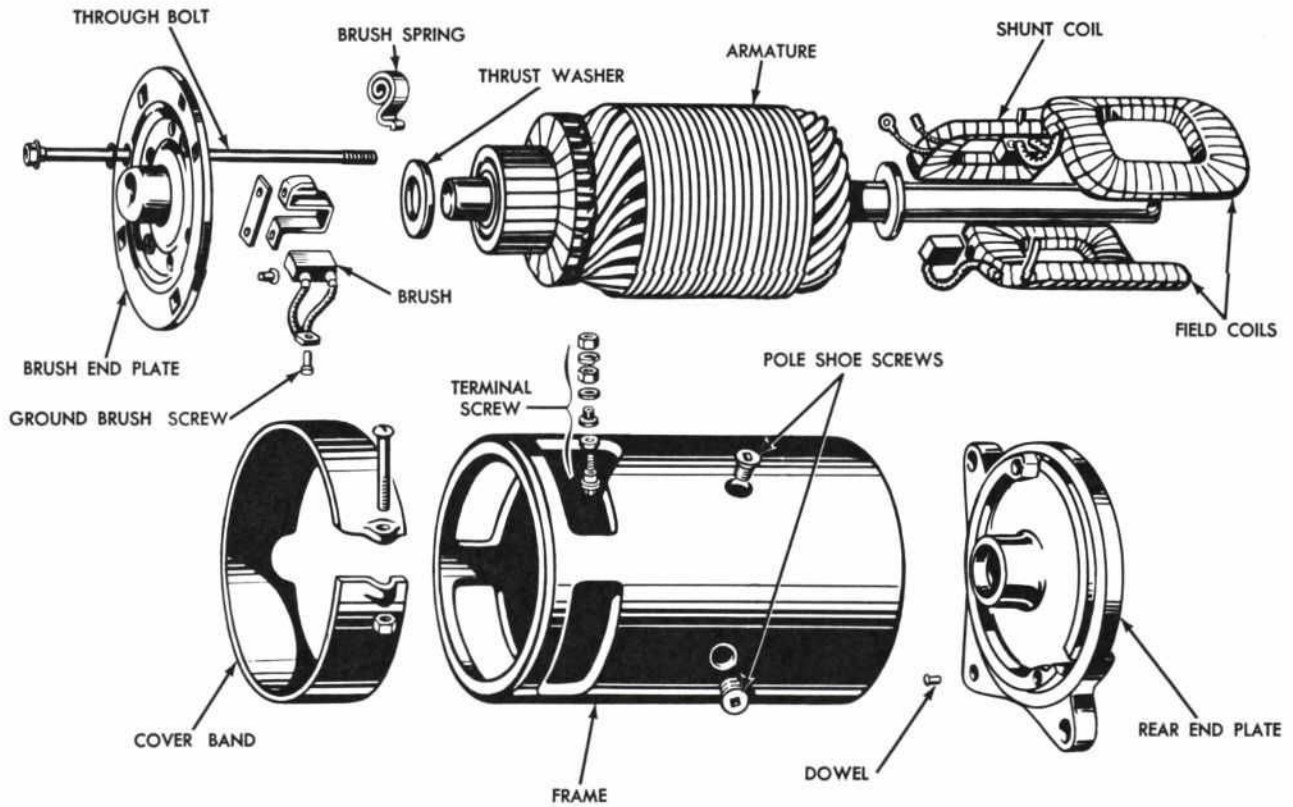
3. Remove the brushes from their holders, and remove the brush end plate.

4. Unscrew the ground brush screws, and remove the ground

brushes.

5. Unscrew the three field-pole shoe screws as shown in Fig. 47. The arbor press prevents the wrench from slipping out of the screw.

6. Unsolder the field coil leads from the terminal screw, and re-



J1058-A

FIG. 50—Disassembled Car and Light Truck Starter Motor

move the pole shoes and field coils from the frame.

7. Remove the nut and washers from the terminal and remove the terminal. Remove any excess solder from the terminal slot. Use a 300-watt soldering iron for soldering operations on the starter terminal.

CLEANING AND INSPECTION

1. Wipe the field coils, armature, commutator, and armature shaft with a clean cloth. Wash all other

parts in solvent and dry the parts.

2. Inspect the armature windings for broken or burned insulation and unsoldered connections.

3. Check the armature for open circuits and grounds.

4. Check the commutator for run-out (Fig. 51), and inspect the armature shaft and the two bearings for scoring and excessive wear.

5. Check the brush holders for broken springs and the insulated brush holders for shorts to ground. Tighten any rivets that may be loose. Replace the brushes if worn to 5/16 inch in length.

6. Check the brush spring tension. Replace the springs if the tension is not within limits.

7. Inspect the field coils for burned or broken insulation and continuity. Check the field brush solder connections and lead insulation.

ASSEMBLY

1. Install the terminal screw with insulator washers and terminal nut. Be sure to position the slot in the screw parallel to the frame end surface.

2. Position the series field coils with the leads in the terminal screw slot, and the shunt coil as shown in Fig. 52.

3. Install the field pole shoes and screws. **As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes, then stake the screws.**

4. Solder all leads, using rosin core solder. Use a 300-watt iron.

5. Position the shunt coil ground lead under the ground brush terminal

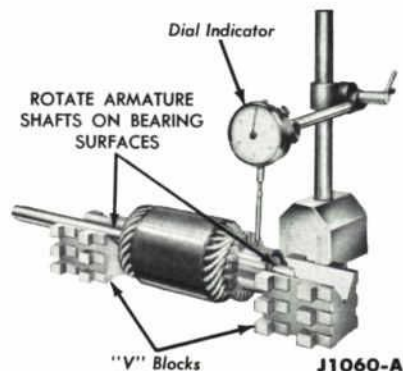


FIG. 51—Commutator Runout Check

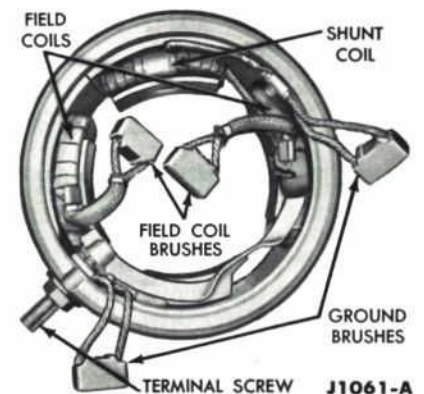


FIG. 52—Field Coil Assembly

farthest from the starter terminal (Fig. 52). The other shunt coil lead is soldered to the series field coil lead farthest from the starter terminal.

6. Install the screws that connect the ground brushes to the starter frame.

7. Install the brush end plate making sure that the brush plate boss is located in the slot in the starter frame. **Do not pinch the brush leads between the end plate and the frame.**

8. Place a thrust washer on each end of the shaft, slide the armature in place, and install the rear end plate with the end plate dowel located in the starter frame slot.

9. Install the through bolts.

10. Install the brushes in their holders being sure to center the brush springs on the brushes.

11. Place the cover band with cover band gasket on the starter, and tighten the clamp screw.

12. Install the starter drive.

13. Check the starter operation and no-load current draw before installing on the vehicle.

ARMATURE REPLACEMENT

Remove the starter drive (as explained in starter drive removal), through bolts, rear end plate, and cover band. **Be sure to remove all burrs from the shaft to prevent scoring the rear end plate bushing.** Remove the armature.

Before installing the new armature, pull the brushes from their holders. Slide in the armature, and install the rear end plate and through bolts. **The end plate dowel must be aligned with the slot in the starter frame.**

Replace the brushes in their holders, center the brush springs on the brushes, and install the cover band. Install the starter drive.

BRUSH REPLACEMENT

Replace the starter brushes when they are worn to 5/16 inch in length. Always install a complete set of new brushes.

1. Loosen and remove the cover band.

2. Remove the two through bolts from the starter frame.

3. Remove the brushes from their holders.

4. Remove the brush end plate and the armature rear end plate assembly.

5. Unsolder the brush leads from the field coils.

6. Unscrew the ground brush terminal screws, and remove the ground brushes.

7. Clean the dirt from the brush end plate. Replace the brush end plate if the insulation between the field brush holder and the end plate is cracked or broken.

8. Make sure that the new brushes slide freely in the holders, then seat the new brushes by sanding (Fig. 53).

9. Solder the new field brushes to the field coils.

10. Position the shunt coil ground lug under the ground brush terminal farthest from the starter terminal. Connect the new ground brushes to the starter frame with the mounting screws.

11. Install the brush end plate.

12. Slide the armature rear end plate assembly in place. **Make sure that the locating boss in the brush end plate and the dowel in the rear end plate are located in the slots in the starter frame.**

13. Replace the two through bolts in the starter end plates.

14. Place the brushes in their holders. Be sure to center the brush springs on the brushes.

15. Install the cover band with cover band gasket and tighten the clamp screw.

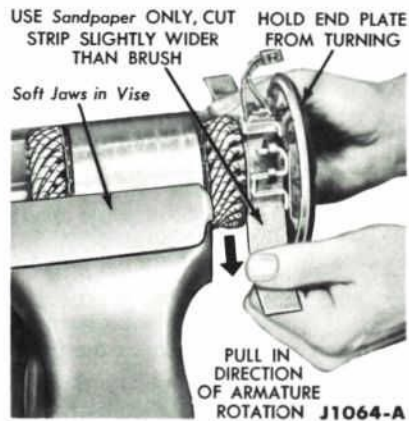


FIG. 53—Starter Brush Seating

4 STARTER OVERHAUL—HEAVY TRUCKS

AUTOLITE STARTER

A disassembled view of the Autolite starter is shown in Fig. 54.

DISASSEMBLY

1. Remove the cover band and remove the brushes from their holders.

2. Remove the two through bolts and the brush end plate mounting screws.

3. Remove the armature, brush end plate and drive housing from the frame. Remove the terminal from the frame.

4. Remove the four field pole shoes and slide the field coils out of the frame. If the brushes are to be replaced at this time, unsolder the old

brushes from the field coils and solder new brushes in their place. The ground brushes are riveted to the brush end plate. Remove the rivets and rivet new brushes to the end plate.

5. The starter drive is the "Folo-Thru" type. It is held in position on the armature shaft by a locking screw and two keys. Compress the starter drive spring slightly on the armature end of the spring and remove the locking screw. Slide the starter drive off the armature shaft. No further disassembly of the drive should be made. The drive is serviced as a complete unit. **Do not lubricate the Autolite starter drive. It should run freely after cleaning**

in kerosene and wiping dry.

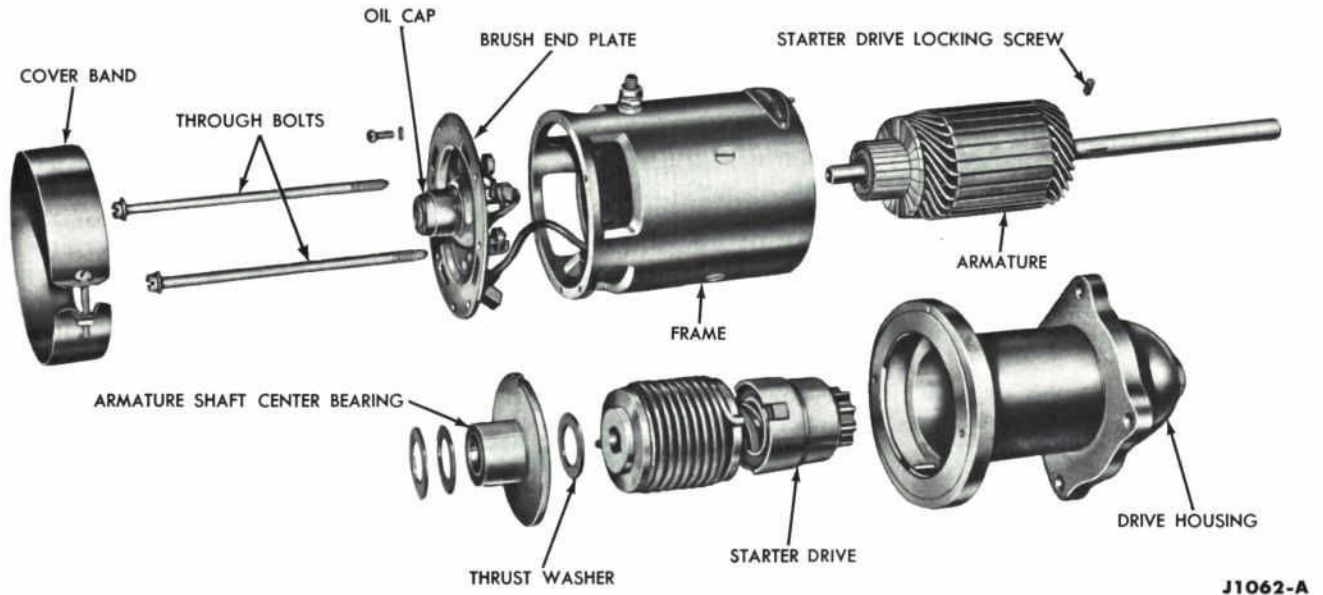
CLEANING AND INSPECTION

1. Wipe the field coils, armature, commutator, and armature shaft with a clean cloth. Wash all other parts in solvent and dry the parts. Remove the oil cap and oil felt from the brush end plate before cleaning the end plate.

2. Inspect the armature windings for broken or burned insulation and unsoldered connections.

3. Check the armature for open circuits and grounds.

4. Check the commutator for run-out (Fig. 51), and inspect the armature shaft and the two bearings for scoring and excessive wear.



J1062-A

FIG. 54—Disassembled Autolite Starter

5. Check the brush holders for broken springs and the insulated brush holders for shorts to ground. Tighten any rivets that may be loose. Replace the brushes if worn to 5/16 inch in length.

6. Check the brush spring tension. Replace the springs if the tension is not within specified limits.

7. Inspect the field coils for burned or broken insulation. Check the field

brush solder connections and lead insulation.

ASSEMBLY

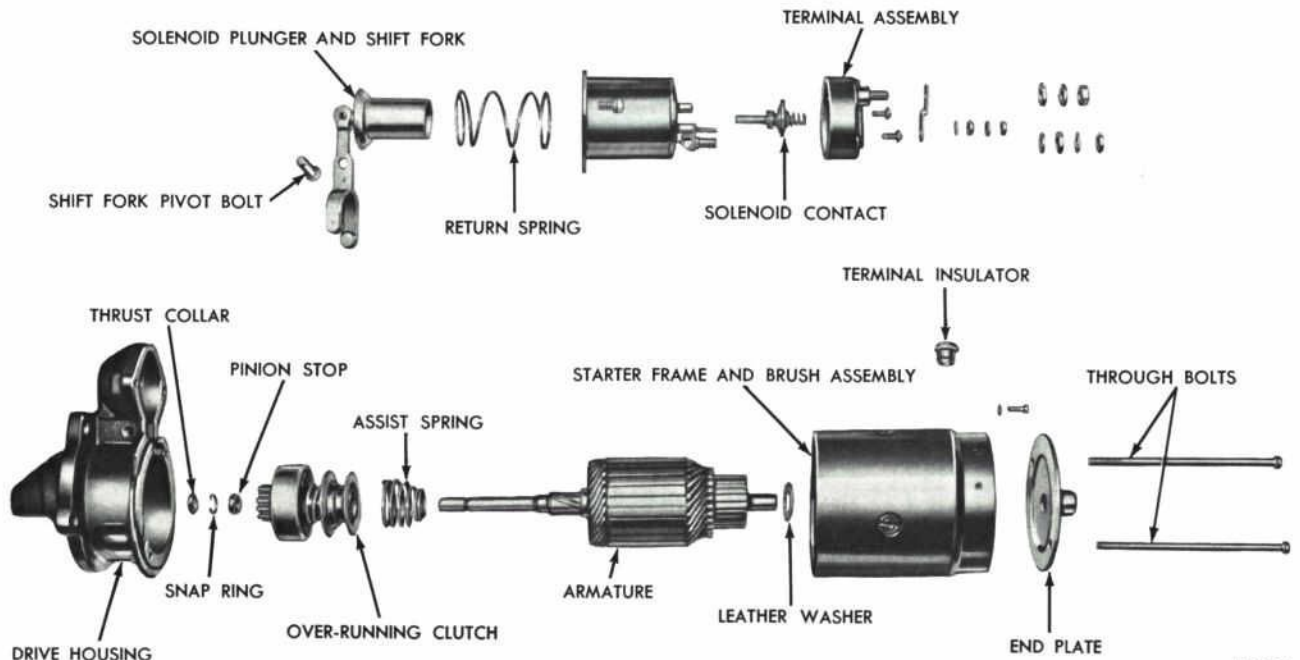
1. Position the thrust washers and armature shaft center bearing on the armature shaft in the order shown in Fig. 54.

2. Slide the drive on the shaft, and install the drive locking screw.

3. Position the armature and drive

in the drive housing so that the slot in the armature shaft center bearing support plate engages the pin in the drive housing, and the bearing is seated firmly in the housing.

4. Slide the field coils into the frame with the brush leads opposite the terminal hole, and install the field pole shoes. **As the pole shoe screws are tightened, strike the frame several sharp blows with a soft-faced**



J1063-A

FIG. 55—Disassembled Delco Positive-Action Starter

hammer to seat and align the pole shoes. Install the terminal.

5. Attach the brush end plate to the frame with the six screws. Position the armature and drive housing into the frame with dowel engaging the hole in the drive housing, and install the through bolts.

6. Install the brushes in their holders making certain that the brush springs are centered on the brushes and the insulated brush leads are clear of the armature.

7. Install the cover band (with gasket) oil felt and oil cap. Put a few drops of engine oil in the oil cap opening.

DELCO POSITIVE-ACTION STARTER

DISASSEMBLY

A disassembled view of the Delco positive-action starter is shown in Fig. 55.

1. Remove the starter terminal to solenoid terminal screw, remove the two through bolts and remove the housing and end plate.

2. Remove the two starter solenoid mounting screws and the shift fork pivot bolt and remove the solenoid and armature assembly.

3. Remove the thrust collar from the armature shaft. Drive the pinion stop toward the armature and off the snap ring, then remove the snap ring. The pinion stop, overrunning clutch and assist spring may now be slid off the armature shaft.

4. The brushes are attached to the brush holders by screws (Fig. 55). Remove the brushes, then pull the brush holder pivots from the mounting brackets and remove the brush holders and brush springs.

5. Slide the insulating grommet, from the starter terminal, remove the field pole shoes and remove the field windings.

ASSEMBLY

Before assembling the Delco starter, use the same cleaning and inspection procedures as those for the Autolite starter, except do not use a solvent on the overrunning clutch. Wipe the clutch clean with a clean cloth.

1. Assemble the field windings and pole shoes to the starter frame. Position the terminal lugs through the terminal opening and install the terminal insulator. Install the brush holders and springs, and attach the brushes and leads.

2. Lubricate the drive end and splines of the armature shaft with SAE 10W oil. **Do not use heavier oil.** Assemble the assist spring and overrunning clutch to the armature shaft (Fig. 55).

3. Assemble the pinion stop on the armature shaft with the cupped surface facing the end of the shaft. Stand the armature on end on a wooden surface with the drive end up. Position the snap ring on the upper end of the shaft and hold it in place with a wood block. Hit the wood block with a hammer, forcing the snap ring over the end of the shaft. Slide the snap ring into the groove, and squeeze it so that it fits well into the groove.

4. Slide the thrust collar onto the shaft with the shoulder next to the snap ring. Slide the pinion stop next to the snap ring and with two pairs of pliers (one pair on each side of the shaft), grip the pinion stop and thrust collar and squeeze until the snap ring is forced into the pinion stop.

5. Lubricate the drive housing bushing with several drops of SAE 10W oil, position the shift fork lever on the overrunning clutch collar, assemble the armature and shift fork into the housing (Fig. 55) and install the shift fork pivot bolt.

6. Position the return spring on the solenoid plunger and attach the solenoid to the drive housing.

7. Position the starter frame and brush assembly over the armature so that the starter terminal is in line with the solenoid terminal (apply sealing compound between the frame and the solenoid flange).

8. Place the leather washer over the end of the shaft, lubricate the end plate bushing with SAE 10W oil, position the end plate and install the through bolts.

9. Install the starter terminal to solenoid terminal screw.

ARMATURE REPLACEMENT

To remove the armature from the Autolite and Delco starters, disassemble the starters with the exception of the field coils. Follow the starter disassembly procedures.

COMMUTATOR TURNING

Check the commutator runout as shown in Fig. 51. If the surface of the commutator is rough or more than 0.002 inch out-of-round, turn it down.

On the Delco starter, undercut the mica 1/32 inch.

Polish the commutator with #00 or #000 sandpaper to remove all burrs left by the turning operation. Be sure that no copper particles remain on the insulation between the segments. It is not necessary to undercut the mica on the Autolite starter commutator.

AUTOLITE STARTER BRUSH REPLACEMENT

Replace the starter brushes when they are worn to 5/16 inch in length. Always install a complete set of new brushes.

1. Loosen and remove the cover band and the two through bolts from the starter frame.

2. Remove the brushes from their holders, the brush end plate, and the armature rear end plate assembly.

3. Unsolder the brush leads from the field coils, unscrew the ground brush terminal screws, and remove the ground brushes.

4. Clean the dirt from the brush end plate. Replace the brush end plate if the insulation between the field brush holder and the end plate is cracked or broken.

5. Make sure that the new brushes slide freely in the holders, then seat the new brushes by sanding (Fig. 53).

6. Solder the new field brushes to the field coils.

7. Position the shunt coil ground lug under the ground brush terminal closest to the starter terminal, and connect the new ground brushes to the starter frame with the ground brush screws.

8. Install the brush end plate. Slide the armature rear end plate assembly in place. **Make sure that the locating boss in the brush end plate and the dowel in the rear end plate are located in the slots in the starter frame.** Install the two through bolts in the starter end plates.

9. Place the brushes in their holders. Be sure to center the brush springs on the brushes. Install the cover band (with gasket), and tighten the clamp screw.

DELCO STARTER BRUSH REPLACEMENT

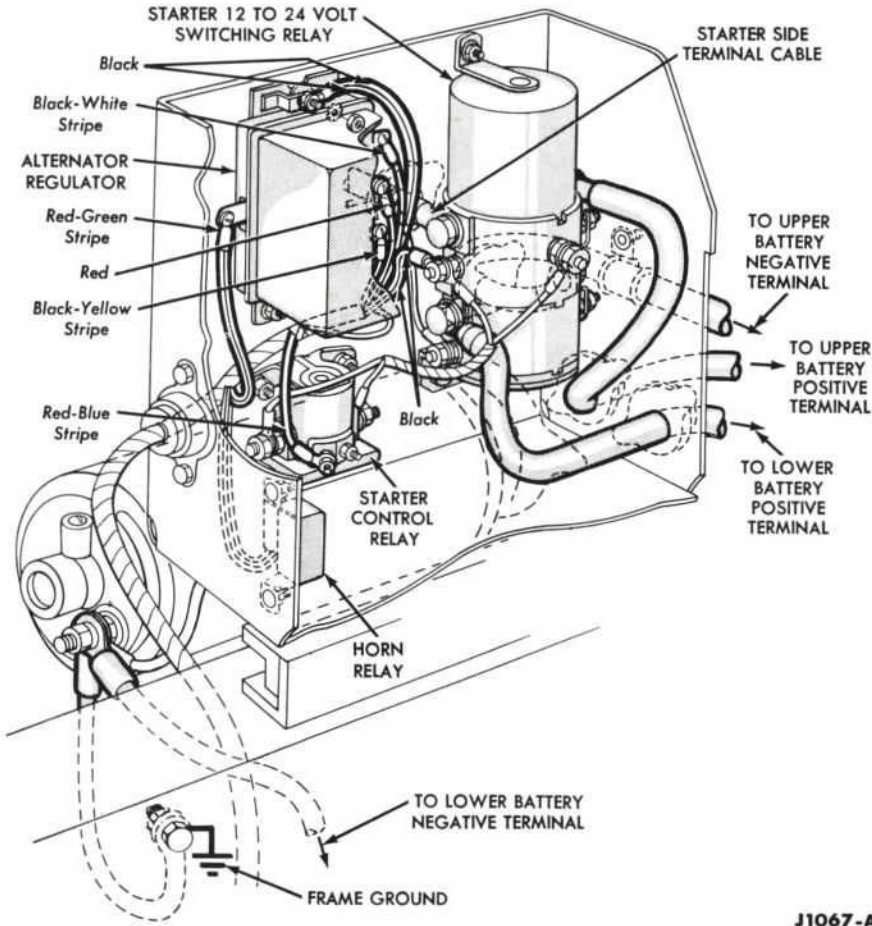
The brushes on the Delco positive-action starter are attached to the brush holders with screws. Remove

5 24-VOLT STARTER AND RELAY OVERHAUL

the starter through bolts and the end plate to gain access to the brushes. Remove the brush holders and springs and clean the dirt from the surfaces before installing the new brushes.

STARTING MOTOR REMOVAL

1. Disconnect the cables from the motor. Remove four cables at two connections (Fig. 56). Note location



J1067-A

FIG. 56—24-Volt Starter Connections

of cables for proper replacement.

2. Remove three starter motor retaining bolts and remove the motor.

INSTALLATION

1. Position the starter motor assembly and install the retaining bolts.

2. Connect the cables to the starter. Be sure that the cables are properly located (Fig. 56). Tighten the cables securely.

3. Check the starter operation.

STARTER OVERHAUL

Disassembly. A disassembled view of the starter is shown in Fig. 57.

1. Scribe the brush end plate, center bearing support, drive housing and frame for assembly. Remove the drive housing mounting bolts and remove the drive housing, drive, center bearing support and armature.

2. Remove the oil wick retaining plugs from the center support bearing and from the drive housing bearing and remove the oil wicks.

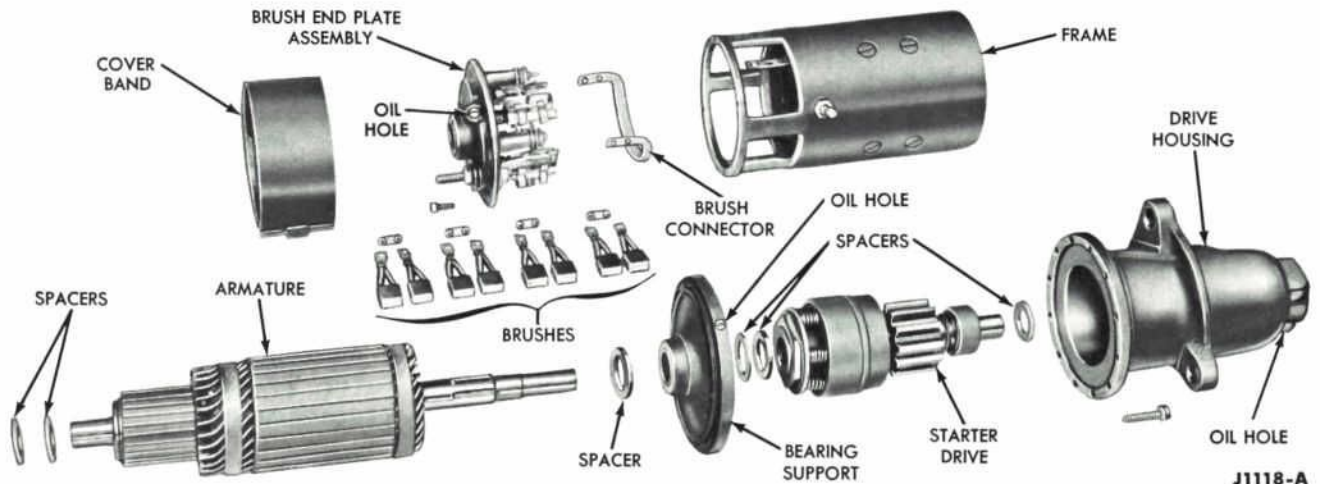
3. Remove the brush cover band, and remove all the brushes. Remove the brush end plate mounting screws and remove the brush end plate assembly, and brush connector strap.

4. Disassemble the brush holders and terminal screw from the brush end plate. Remove the bearing oil wick.

5. Remove the terminal from the frame. Remove the field coil shoe screws. Remove the shoes and slide the field coils and insulator strip out of the frame.

Cleaning and Inspection

1. Wipe the field coils, armature



J1118-A

FIG. 57—Disassembled 24-Volt Starter

commutator, armature shaft, and drive, with a clean cloth. The threaded shaft of the drive may be cleaned with solvent. Do not immerse the unit in the solvent as the clutch plates are packed in a special grease. The drive is serviced as a unit. Wash all other parts in solvent and dry the parts.

2. Inspect the armature windings for broken or burned insulation and broken connections.

3. Check the armature for open circuits and grounds.

4. Check the commutator for run-out, and inspect the armature shaft and the three bearings for scoring and excessive wear.

5. Check the brush holders for broken springs and for shorts to ground. Replace the brushes if worn to $\frac{3}{8}$ inch in length.

6. Check the brush spring tension. Replace the brush holder if the spring tension is less than 45 ounces. The brush springs are replaced only as a complete brush holder assembly.

7. Inspect the field coils for burned or broken insulation. Check the bearing oil wicks. Replace them if they have become hardened.

Assembly

1. Slide the field coils into the frame with the side terminal in line with the side terminal hole. Place the terminal insulator strip between the coil terminal connectors and the starter frame. Install the field pole shoes. **As the pole shoes are tightened, strike the frame several sharp blows with a soft-faced hammer to seat and align the pole shoes.** If new field coils are being installed, apply heat from a heat lamp to the new coils until the heavy coat of varnish is pliable, before installing. Install the side terminal.

2. Install the brush holders and the end terminal on the brush end plate (Fig. 58). Temporarily install, with a screw in each end, the brush connector strap (Fig. 57). All four brush holders are insulated from the brush end plate and from each other.

3. Install the bearing oil wicks in the bearing oil holes and apply a few drops of SAE 30 oil to the wicks before installing the retaining plugs.

4. Position the brush end plate to the end of the starter frame so that the field coil connectors are positioned over the brush connectors which are not connected to the brush connector strap (Fig. 57). Install the end plate mounting bolts.

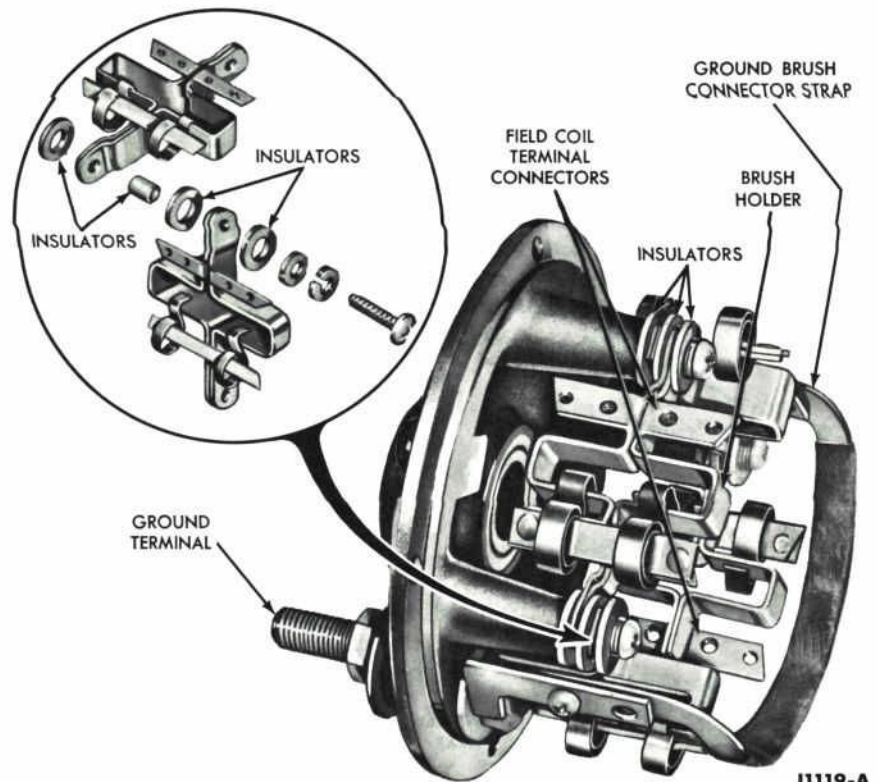


FIG. 58—Brush End Plate Assembly

5. Place a large steel spacer washer and then a brass washer on the commutator end of the armature shaft. Slide the armature into the frame, with the shaft in the brush plate bearing.

6. Place a large brass washer on the drive end of the armature shaft. Position the center bearing support on the shaft (Fig. 57). Rotate the support so that the oil hole will be near the top outside of the starter when it is mounted on the engine.

7. Place the two remaining large spacer washers on the armature shaft. Apply a film of light grease to the armature spline and a thin film of SAE 10 oil to the starter drive screw. Slide the starter drive on the shaft. Place the small spacer washer on the end of the armature shaft and install the drive housing so that the starter side terminal will be in the position shown in Fig. 57, when the starter is mounted on the engine.

8. Install the brushes. The brushes are attached with the pig tails facing away from the springs, and looped back over the screws when the brushes are placed in the holders.

9. Install the cover band with gasket.

SERIES-PARALLEL STARTER RELAY OVERHAUL

DISASSEMBLY

A disassembled view of the starter relay is shown in Fig. 59.

1. Remove the through bolts, end plate, through bolt gaskets and the end plate gasket.

2. Remove the plunger snap ring, retaining washer, return spring, bottoming plate and bottoming plate gasket.

3. Rotate the plunger and contact assembly 90° and lift it out of the assembly. Remove the bottoming felt washers. **Do not disassemble the plunger and contact assembly.**

4. Remove the connector straps, solenoid coil terminal nut, and washers. Remove the bottom contact housing and the top contact housing. Push the coil terminal screw into the center of the top contact housing as the housing is being removed. Remove the gaskets.

INSPECTION

If the contact points are badly pitted, replace them. The moving contact plates must be free to move on the square insulator, but should

J1119-A

be sandwiched firmly between the heavy and light spring.

The measured free-height of the

plunger return spring should be approximately $1\frac{3}{4}$ inches. The current draw of the solenoid is 7 amperes

at 12 volts.

ASSEMBLY

1. Place a new gasket on the solenoid coil. Assemble the top contact housing to the coil. Push the coil terminal screw through the hole in the housing as the housing is being placed in position.

2. Place a new gasket, the flat washer, and lock washer on the coil terminal. Install the terminal nut and tighten.

3. Place a new gasket on the top contact housing and position the bottom housing with the lug in the notch.

4. Place the plunger and contact assembly into the housings. Hold it approximately $\frac{1}{4}$ inch from bottoming and rotate it 90° to position the contact plates between each set of housing contacts.

5. Place a new gasket on the bottom housing. Place two new bottoming felt washers on the plunger shaft. Position the plunger bottoming plate with its notch on the bottom housing lug. Place the plunger return spring and retaining washer on the plunger shaft and install the snap ring.

6. Place a new gasket in the end plate recess. Place the through bolts with lockwashers through the end plate holes. Place a new gasket on each through bolt. Position the end plate (Fig. 59) on the bottom housing and tighten the through bolts. Check all of the fitted surfaces and make certain that the various gaskets are in position before tightening the through bolts.

7. Install the connector straps as shown in Fig. 59. The straps connect terminals 4 and 6, 3 and 5, and 7 and 9.

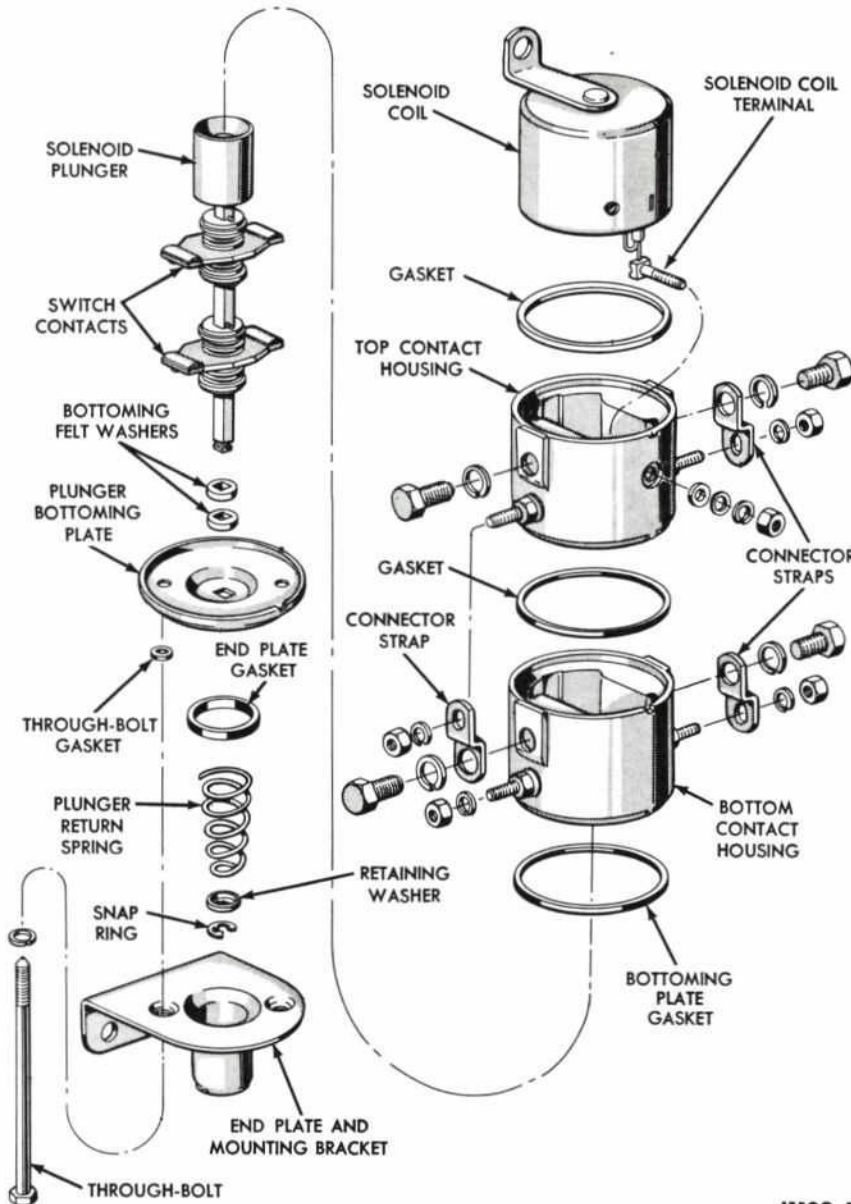


FIG. 59—Disassembled Starter Relay

6 STARTER DRIVES

FALCON AND ECONOLINE STARTER DRIVE

The starter drive used on the Falcon and Econoline 6-cylinder engine is shown in Fig. 60.

REPLACEMENT

1. Loosen and remove the brush cover band and the starter drive actuating lever cover.

2. Loosen the through bolts enough

to allow removal of the drive gear housing and the starter drive actuating lever return spring.

3. Remove the pivot pin retaining the starter drive actuating lever and remove the lever.

4. Remove the drive gear retaining spring clip from the end of the armature shaft and remove the drive gear assembly.

5. Install the drive gear assembly

on the armature shaft and install a new retaining clip.

6. Position the starter gear actuating lever on the starter frame and install the retaining pivot pin. **Be sure the actuating lever properly engages the starter drive assembly.**

7. Position the starter drive actuating return spring and drive gear housing to the starter frame, and then tighten the through bolts.

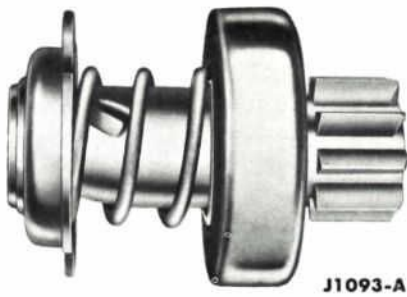


FIG. 60—Falcon and Econoline 6-Cylinder Engine Starter Drive

8. Position the starter drive actuating lever cover and brush cover band on the starter. Tighten the brush cover band retaining screw.

CAR AND LIGHT TRUCK STARTER DRIVE

The "Folo-Thru" starter drive is shown in Fig. 61. The "Folo-Thru" drive is serviced only as a complete unit, because of the calibration re-

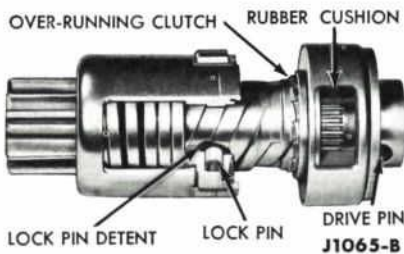


FIG. 61—'Folo-Thru' Starter Drive

APPLY DOWNWARD PRESSURE
ON END OF STARTER

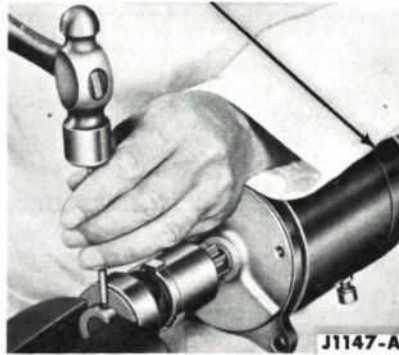


FIG. 62—Starter Drive Removal

quirements on the lock pin and anti-drift pin springs.

A sticking starter drive can be cleaned in kerosene. Use a brush to remove grease and dirt from the worm threads until all grit is removed. **Do not oil the starter drive. It should work freely after cleaning in kerosene and wiping dry.**

The "Folo-Thru" drive has a lock pin which holds the pinion from rotating when it is in the extended position. Once the pin has dropped into place, it will not disengage unless the starter is mounted on the car and the engine speed reaches 310-390 rpm. It cannot be forced out of position by hand.

To remove the "Folo-Thru" drive, place the end of the drive in a vise, with the shoulder of the drive tight against the end of the vise jaws (Fig. 62). Press down on the end of the starter to compress the rubber cushion. This exposes the lower end of

the drive pin, which may be driven out from above (Fig. 62).

Inspect the pinion for burrs and broken or badly worn teeth. Check the action of the pinion on the worm threads. It should slide freely on the threads. Check the drive spring to see if it is cracked, broken, or the end tangs are bent. If any of the pinion teeth are badly worn, burred or broken, it will be necessary to replace the drive.

To install the drive assembly, place the end of the drive in a vise, with the shoulder of the drive tight against the end of the vise jaws (Fig. 63). Position the starter shaft in the drive so that the drive pin holes are aligned. Lift up on the outer end of the starter to compress the rubber cushion and expose the drive pin hole. Install the drive pin.



FIG. 63—Starter Drive Installation

PART 6

SPECIFICATIONS

GENERATORS AND REGULATORS

Generator Type	Amperes At 15 Volts	Brushes		Commutator Maximum Runout	Brush Wear Limit Inch	Regulator Type
		Original Length Inches	Spring Tension Ounces			
Ford	25	$\frac{7}{32}$	20-26	0.002	$\frac{3}{8}$	Ford
Ford	30	$\frac{7}{32}$	20-26	0.002	$\frac{3}{8}$	Bosch
	30	$\frac{7}{32}$	20-26	0.002	$\frac{3}{8}$	Ford
Ford	35	$\frac{7}{32}$	20-26	0.002	$\frac{3}{8}$	Ford
Delco-Remy	35	1	16	0.002	$\frac{3}{8}$	Delco-Remy
Ford	40	$\frac{7}{32}$	20-26	0.002	$\frac{3}{8}$	Ford
Autolite	40	$\frac{1}{16}$	35-41	0.002	$\frac{3}{8}$	Autolite

ALTERNATORS AND REGULATORS

Alternator Type	Amperes At 15 Volts	Brushes		Commutator Maximum Runout	Brush Wear Limit Inch	Regulator Type
		Original Length Inches	Spring Tension Ounces			
Leece-Neville	40	$\frac{1}{16}$	8-10	0.002	$\frac{3}{32}$	Leece-Neville
Leece-Neville	60	$\frac{3}{8}$	4-5	0.002	$\frac{3}{32}$	Leece-Neville

REGULATORS

Manufacturer	Current Rating	Cut-in Voltage	Reverse Amperage To Open	Voltage Regulation 75° F.	Current Limiter (Amperes)
GENERATOR					
Ford	25	12.4-13.2	8	14.6-15.4	23-27
Ford and Bosch	30	12.0-12.8	6-9	14.6-15.4	28-32
Ford and Delco-Remy	35	12.3-13.5	8	14.3-14.9	34-38.5*
Autolite	40	12.5-13.8	8	14.3-14.9	43-47
ALTERNATOR					
Leece-Neville	40	—	—	13.9-14.1**	N.A.
Leece-Neville	60	—	—	13.5-14.3**	58-62

*@ 85° F.

**Upper contacts only; Lower contacts 0.1 to 0.3 lower.

BELT TENSION (GENERATORS—ALTERNATORS)

Car Engines	Ibs.
144, 170, 221, 260, 223 & 292	new 90-120 used* 60-90†
352, 390 & 406	new 100-130 used* 80-110
Truck Engines	
223, 262, 292, 302 & 332	new 90-120 used* 60-90
401, 477 & 534	new 120-150 used* 90-120

*A belt is considered used after 10 minutes of operation
†221 and 260 engines—80-110 lbs.

STARTER MOTOR

Manufacturer	Type of Drive	No. Brushes Used	Brush Mfg. Length (Min.) (Inches)	Brush Wear Limit (Inches)	Brush Spring Tension (Ounces)
Ford	Folo-Thru	4	0.43-0.46	Half Size	48-56
Delco	Positive-Action	4	0.61-0.63	Half Size	35
Autolite	Folo-Thru	4	0.46-0.48	Half Size	42-53
Delco	Folo-Thru	4	0.75	Half Size	24 Minimum
Autolite	Positive-Action	4	0.46-0.48	Half Size	42-53
Ford	Positive-Action	4	0.46-0.48	Half Size	42-53

STARTING MOTOR—24 VOLT

Brush Wear Limit.....	5/8 Inch
Brush Spring Tension.....	45 Ounces Min.

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