

PART TWO—ENGINE AND ELECTRICAL

SECTION III—STARTING SYSTEM

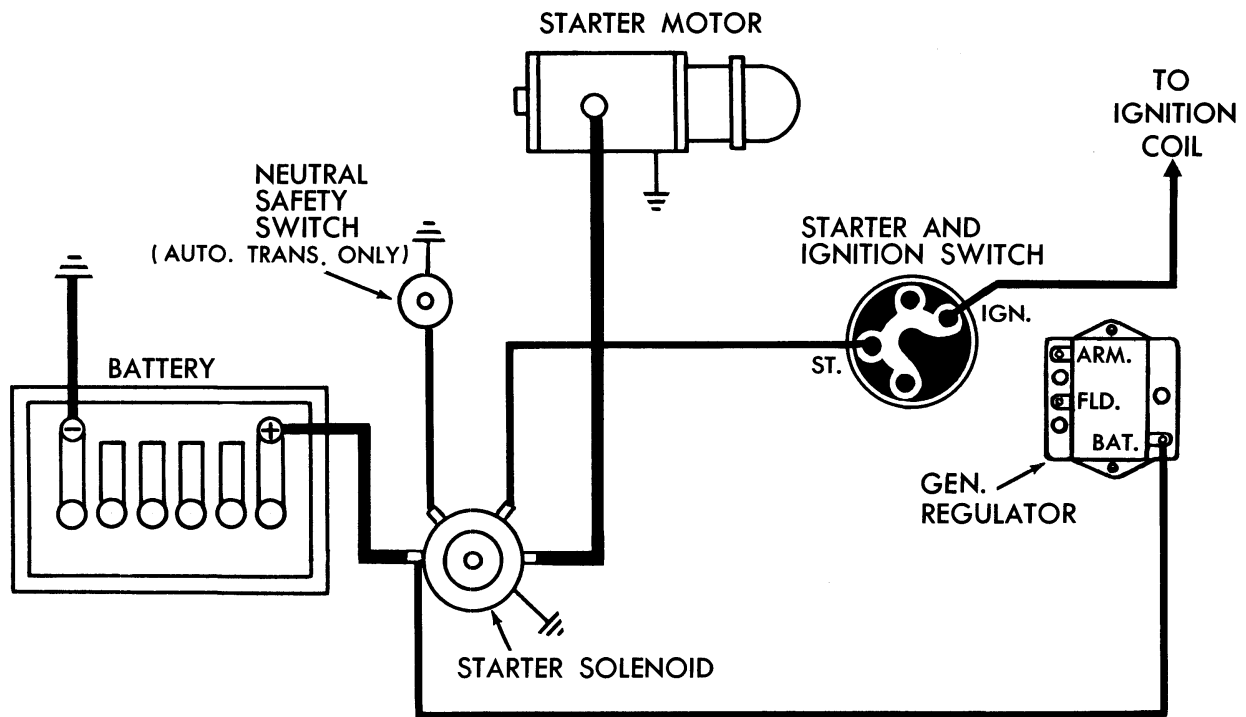
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1. PERFORMANCE TESTS

In order to insure accurate readings and to avoid possible damage to the starter and gears, performance tests should be made with the starter removed. The starter motor should first be checked to determine whether the free running voltage and current are within specifications as indicated on Data and Specifications Chart.

FREE RUNNING TEST

Connect a heavy lead from a fully charged battery to a carbon pile resistor. Connect another heavy lead from the resistor through an ammeter to the terminal post of the starter. Connect a voltmeter between the starter frame and the ground post of the battery. Connect a heavy lead from the ground post of the battery to the starter frame. It is advisable to connect a switch in this lead. Adjust the carbon pile



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Figure 1—Starting Circuit

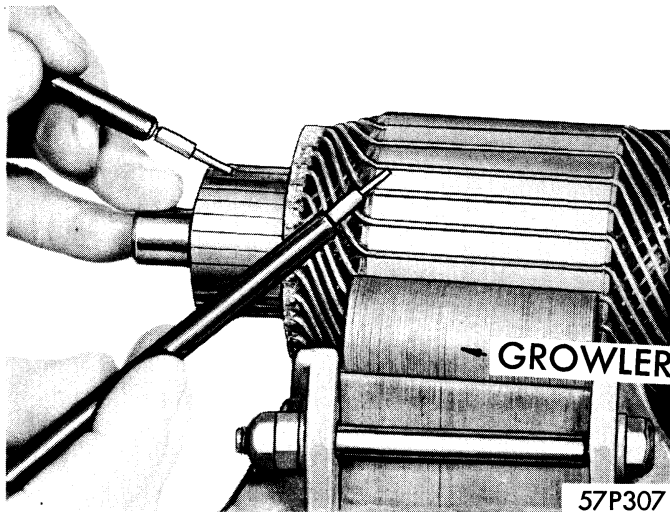


Figure 2—Testing Armature for Ground

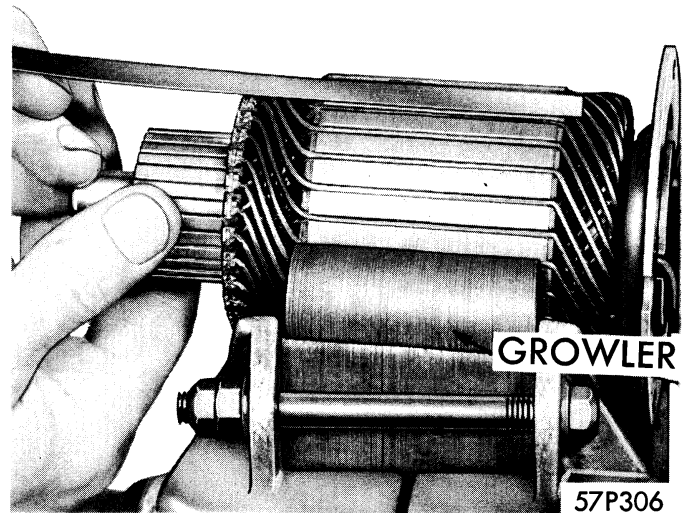


Figure 3—Testing Armature for Short

resistor to specified voltage at the starter. See page 338. If new brushes have been installed run the starter motor for about two minutes to seat the brushes.

The ammeter should indicate the specified average draw at the R.P.M. shown in the Starting Motor Data and Specifications on page 338.

STALL TORQUE TEST

Connect the starter motor to the battery with the resistor, ammeter and voltmeter in the circuit as described in the free running test. Make certain that the ammeter and resistor are of sufficient capacity to carry at least 500 amperes. After securing the starter motor, attach a 12 inch torque arm to the starter motor pinion gear. Hook a spring scale of at least 15 pounds capacity to the end of the torque arm. Before closing the switch, be sure that the resistor is open, to avoid excessive initial torque. Adjust the resistor to specified voltage. Refer to Data and Specifications, page 338, for required amperage draw and torque at the specified voltage.

2. INSPECTION AND BENCH TESTS

Remove the commutator end plate and pull the armature out of the starter frame. Clean the starter parts with a rag dampened with cleaning fluid. Dry all parts with compressed air. Do not immerse the armature assembly, field coils, insulation or brushes in cleaning solvent.

ARMATURE

Inspect the core for scored or damaged laminations, out of place or loose windings, or loose connections at the commutator. Inspect the commutator for roughness, excessive wear, run-out or mica extending above the commutator bars. Check for a bent or worn shaft. Inspection for commutator run-out and bent shaft must be made with the starter drive removed.

Place the armature shaft ends in Vee blocks and check commutator run-out with a dial indicator. If the run-out exceeds .003 inch, the commutator should be refaced in a lathe or with special Tool C-770. The commutator should be polished with No. 00 sandpaper to remove dirt, grease or burred edges. Never use emery cloth to polish the commutator. Remove only enough metal from the commutator to provide a clean smooth surface. Never undercut the mica as dirt and carbon may collect in the grooves and cause a short between the commutator bars.

TESTING ARMATURE FOR GROUND

Test for a grounded armature with a test lamp and probes. Place one probe on the shaft and check each commutator bar. If the lamp lights, a short is indicated and a new armature should be installed. Do not touch the probes to the brush surface of the commutator or to the bearing surface of the shaft. See Figure 2.

TESTING ARMATURE FOR SHORT

Place armature assembly on the growler on test bench. Turn armature slowly while holding a thin strip of steel over the core of armature. If blade vibrates, coil is shorted. See Figure 3.

TESTING FIELD COILS FOR OPEN CIRCUIT

With the use of test prods, test between the insulated brushes and from each insulated brush to the starting motor terminal. See Figure 4. If the test lamp does not light the coils are open and must be replaced.

TESTING FIELD COILS FOR GROUND

Check for a ground in the field coils by connecting test light prods between the field terminal stud and the starter frame. If the test lamp lights, remove the terminal stud and check the insulating bushing and washers for

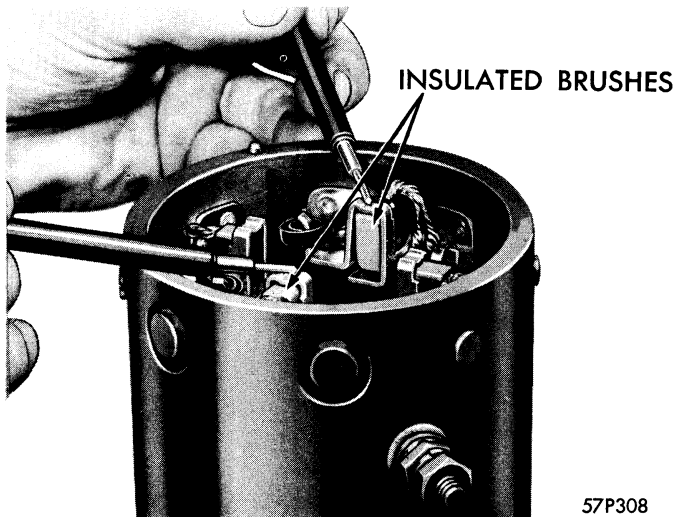


Figure 4—Testing Field Coils for Open Circuit

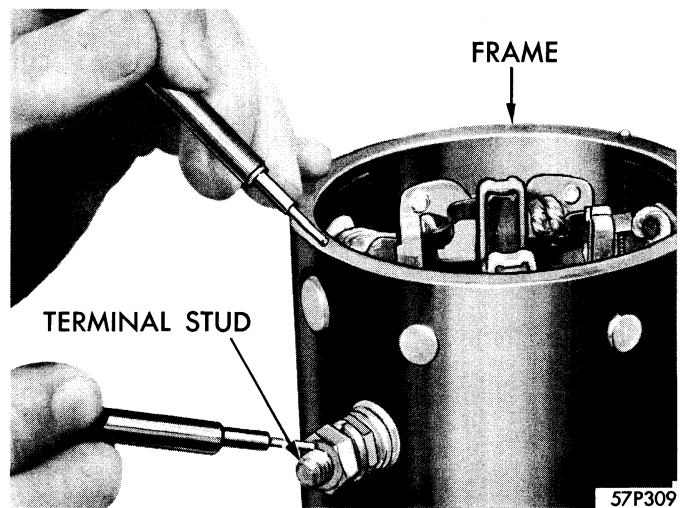


Figure 6—Testing Field Coils for Ground

cracks or damage. If the field terminal stud is properly insulated, separate the coil leads, disconnect the jumper wire between the brushes, and test each coil by connecting one end of the test light to the individual lead and the other end to the starter frame. Remove the pole shoe screw and slide the grounded coil out of the frame.

Inspect the field coils, terminal leads and brush leads for broken, frayed, chafed insulation or loose connections. Resolder all loose connections and repair any frayed or chafed insulation, provided the wire has not been damaged. If the wire has been damaged, the field coil assembly should be replaced. See Figure 6.

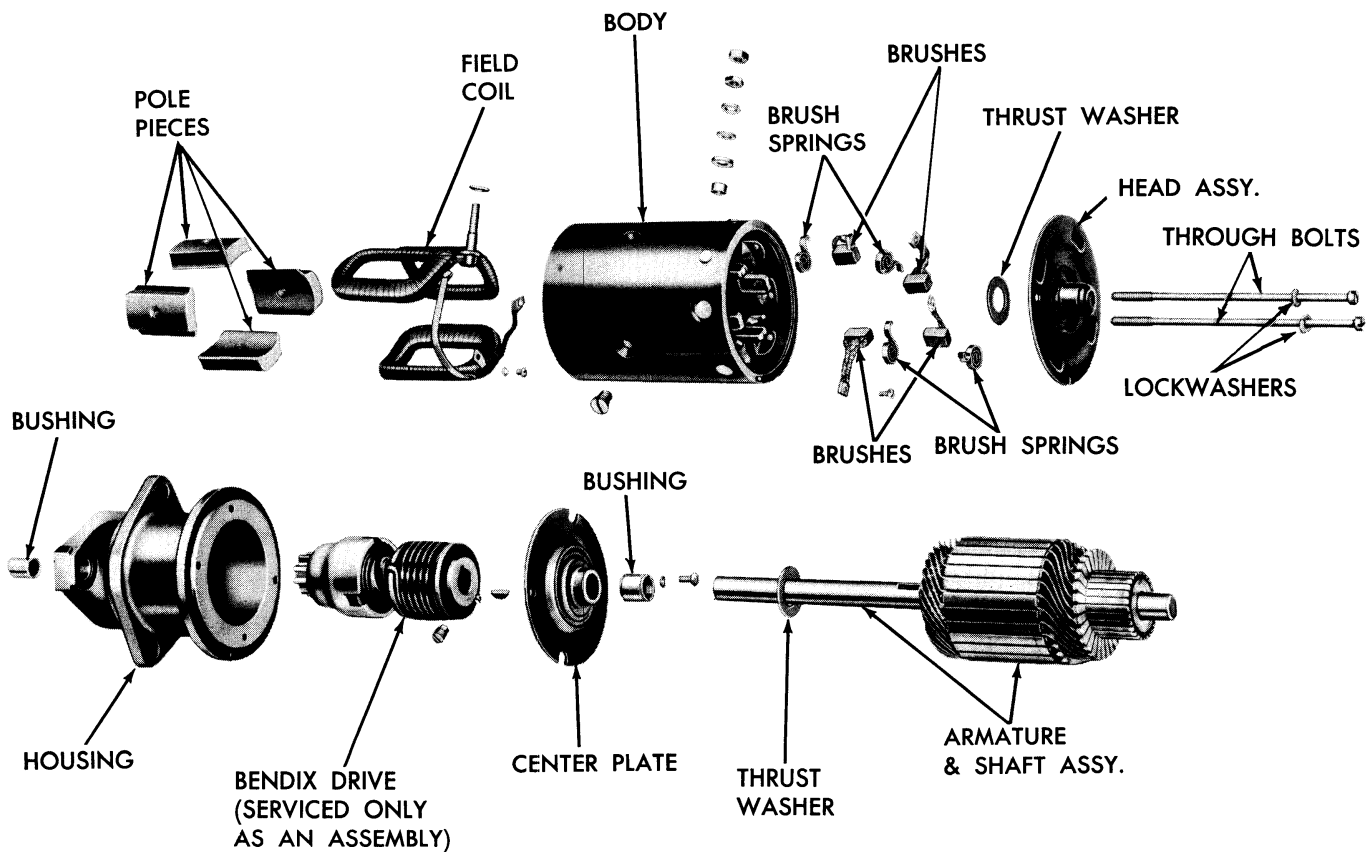


Figure 5—Starter Motor Disassembled

STARTING MOTOR DATA AND SPECIFICATIONS

Models		P-30, LP-1, P-31, LP-2		
Starting Motor Model Number		MDM 6001 (1)	MDL 6004 (2)	MDT 6001 (3)
Maximum Allowable		12		
Armature Shaft End Play		.005 to .030		
Maximum Allowable Armature Run-Out		.003 in.		
Brush Spring Tension		32 to 48 ounces		
Free Running Specifications	Maximum Voltage	11		
	Maximum Amperage Draw	50	60	58
	Minimum Speed—RPM	3600	3400	3800
Stall Torque Specifications	Voltage	4		
	Maximum Amperage Draw	210	225	350
	Minimum Torque-ft. lbs.	5	6	8.5
1. 6 Cyl. Engine, PowerLite Only 2. All except 6 cyl. P.F. and 350 cu. in. V-8 3. V-8 Engine, 350 cu. in. only				

3. STARTER MOTOR DRIVE ASSEMBLY

The starter motor drive assembly is serviced only as an assembly. No attempt should be made to disassemble the unit for repairs other than that described for cleaning and lubricating the unit.

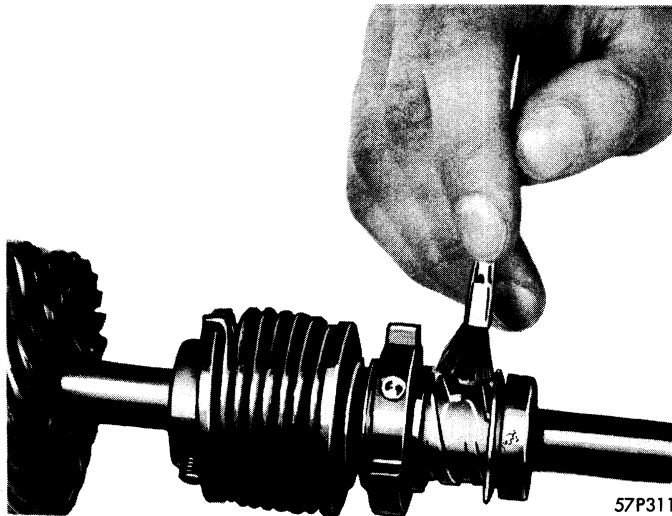


Figure 7—Cleaning Starter Drive Assembly

To remove the drive assembly from armature shaft, loosen the set screw at the end of the drive spring and slide unit from shaft.

IMPORTANT

Do not immerse the drive assembly in any cleaning solution, since this would remove the lubrication originally applied under the screwshaft.

CLEANING AND LUBRICATION

Remove the barrel retaining ring and remove barrel from control nut. Clean threads with a small brush and kerosene. Wipe threads dry and lubricate with a few drops of SAE 10-W engine oil. See Figure 7.

4. ASSEMBLY OF STARTER

Soak the Oilite bushings in SAE 10-W engine oil and apply a light film of oil to the bearing surfaces. Install the thrust washers and the intermediate bearing on the armature shaft. Insert the key in the keyway and install the starter motor drive assembly. Make certain that the starter drive set screw is seated in the armature shaft.

Install the pinion housing on the armature assembly and place the armature assembly in the starter frame. Install the commutator end head. Make sure that the slots in the intermediate bearing and the commutator end head line up with the indexing pins in the frame. Before installing the starter on the engine, make a free running test.

INSTALLING STARTER MOTOR ASSEMBLY

When installing the starter assembly, the starter drive pinion may be in the extended or engaged position. If this is the case, "hand feel" the drive pinion into mesh with the flywheel ring gear teeth before tightening the mounting bolts. Failure to do this may result in damaged ring gear teeth or broken starter housing mounting flanges.

5. DIAGNOSIS PROCEDURES

STARTER TURNS SLOWLY OR DOES NOT OPERATE

1. **BATTERY**—Test for weak or discharged battery. Inspect terminals for corrosion or looseness. Clean and tighten as necessary.

2. **SOLENOID AND SWITCH**—If the solenoid switch fails to "click" when the ignition key is turned, connect a jumper wire from the positive battery post to the small terminal on the solenoid. If this causes the solenoid to "click," check for loose connections at the small terminal on the solenoid switch, the ignition-starter switch, or the fuel gauge. If the solenoid switch fails to "click" when energized with a jumper wire, install a new solenoid.

3. **STARTER MOTOR**—If test indicates that the starter motor is at fault, it should be removed and inspected for repair. A heavy arc, appearing when the battery terminal, indicates a grounded condition in the starter. If no arcing occurs, there is probably a poor brush contact or an open circuit in the starting motor windings.

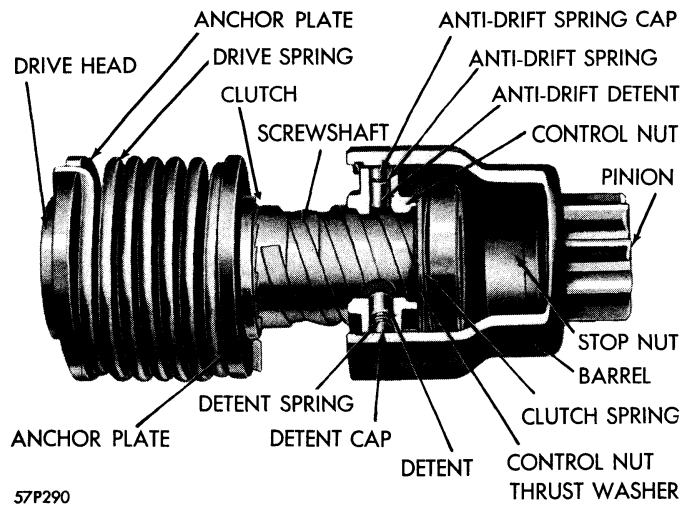


Figure 8—Sectional View of Starter Drive

STARTER FAILS TO ENGAGE

When the starter motor pinion fails to engage with the flywheel ring gear (with the battery fully charged) the trouble is in the starter motor.

1. **STARTER DRIVE**—Inspect for heavy oil, dirt, or ice on the threads of the drive.
2. **STARTER DRIVE SPRING**—Inspect for broken drive spring.

STARTER LOCKS IN ENGAGEMENT

If the starter locks in engagement, it can be freed by pushing car back and forth with the transmission in high gear.

1. **STARTER MOUNTING**—Another way to free a locked starter is to loosen starter mounting, pull starter out slightly and then retighten bolts.
2. **FLYWHEEL RING GEAR OR PINION**—Examine for burrs or chipped teeth. If ring gear is damaged, replace both gear and starter drive unit.

GENERATOR DATA AND SPECIFICATIONS

Models	P-30, LP-1, P-31, LP-2
Make	Auto-Lite
Model No. (Stamped on Generator Name Plate)	GJC-7012A (All models except V-8 with A/C) GHM-6004C (V-8 with A/C)
Type	12 volts—Shunt wound
Armature End Play	.003 to .010 in.
Commutator Run-out	.005 in.
Brush Spring Tension	18 — 36 oz.
Field Coil Draw	1.2 to 1.3 amps @ 10 volts
Motoring Draw	3.4 to 3.9 amps @ 10 volts
Output— Rated Volts Rated Amps Minimum Rated R.P.M. to Determine Rated Load at Rated Voltage at 70° F.	15.0 30.0 1,440 — 1,760 (GHM-6004C, 1704264) 2,050 — 2,250 (GJC-7012A, 1770754)
Battery Voltage	12
Battery Terminal Grounded	Negative

GENERATOR REGULATOR DATA AND SPECIFICATIONS

Models	P-30, LP-1, P-31, LP-2
Model Number (Stamped on Regulator Name Plate)	Auto-Lite — VRX-6201-A, 1642333
Ground Polarity	Negative
Value of Carbon Resistors	Voltage Control 55 to 70 ohms Current Control 34.5 to 42 ohms
CIRCUIT BREAKER Air Gap	.031 to .034 in.
Contact Point Gap	.015 in.
Contact Points Close at	13 to 13.75 volts
Contact Points Open at	8.2 to 9.3 volts with 0 to 6 amp discharge
CIRCUIT REGULATOR Air Gap	.048 to .052 in.
Contact Point Gap	.015 in.
VOLTAGE REGULATOR Air Gap	.048 to .052 in.
Contact Point Gap	.015 in.