

## LUCAS

**Alfa Romeo (1963)**  
**Austin America (1968-71)**  
**Austin Healey (1963-69)**  
**Austin Marina (1973)**  
**Capri (1970-73)**  
**Cortina (1967-70)**  
**Cricket (1971-72)**  
**Jaguar (1963-73)**  
**Jensen Healey (1973)**  
**Lotus (1973)**  
**MG (1963-73)**  
**Rover (1963-73)**  
**Sunbeam (1963-69)**  
**Triumph (1963-73)**

### DESCRIPTION

The Lucas starter is a series wound, four-pole, four-brush motor. Two brushes are grounded and two are insulated and connected to the ends of field coils. Some models have an extended shaft which carries a conventional inertia drive. Other models incorporate a roller clutch drive on the shaft.

### APPLICATION

Model	Lucas (Model) & Part No.
<b>ALFA ROMEO</b>	
Giulietta (1963) .....	(M235BZ2) 25307A/B
<b>AUSTIN</b>	
America (1968) .....	(M35G-1) 25083
America (1969-71) .....	(M35J) 25147
Healey 3000 (1963-67) .....	(M418G) 25578
Sprite MK IV (1963-68) .....	(M35G-1) 25079
Sprite MK IV (1969) .....	(M35J) 25149
Marina (1973) .....	(2M100) 25674
<b>CAPRI</b>	
1600 (1970-72) .....	(M35J) 25183, 25024
2000 (1971) .....	(M35G) 25023A
2000 (1972-73) .....	(M35J) 25024, 25203A
<b>CORTINA</b>	
Cortina & GT (1967) .....	(M35G) 25129, 25130
Cortina & GT (1968-69 Early) .....	①(.....) 25145
Cortina & GT (1969 Late) .....	①(M35J) 25156
Cortina (1970)	
Man. Trans. ....	②(M35J) 25157
Auto. Trans. ....	③(M35G) 25154
GT (1970) .....	③(M35G) 25154
<b>PLYMOUTH CRICKET</b>	
All Models (1971-72) .....	(M35JPE) 25219B
<b>JENSEN HEALEY</b>	
All Models (1973) .....	(3M100) .....
<b>JAGUAR</b>	
<b>6 Cylinder Models</b>	
3.4 & 3.8L (1963-67)	
Man. Trans. ....	(M45G) 26140A
Auto. Trans. ....	(M45G) 26097D
4.2L (1966) .....	(M45G) 26180
4.2L (1967-73) .....	(M45G) 26252A,B
<b>12 Cylinder Models</b>	
XKE V12 (1971 Early) .....	(M45G) 26272A
XKE V12 (Late 1971-72) .....	(M45G) 26327A
XKE V12 (1973) .....	(M45G) 26346

### APPLICATION (Cont.)

Model	Lucas (Model) & Part No.
<b>LOTUS</b>	
Europa II (1973) .....	(M35J) .....
<b>MG</b>	
1098cc & 1275cc (1963-67) .....	(M35G) 25083E/F
1798cc (1963-67) .....	(M418G) 25555
MGC (1969) .....	(M418G) 25604
Midget (1968-73) .....	(M35J) 25149
MGB & GT (1968-70) .....	(M418G) 25616
MGB & GT (1970-73) .....	(2M100) 25660
<b>ROVER</b>	
2000 (1963-67)	
SC .....	(M418G) 25521
TC & Cold Climate .....	(M45G) 26183
2000 SC & TC (1968-70)	
Man. Trans. ....	(M45G) 26183
Auto. Trans. ....	(M418G) 25621
3500S (1970-71) .....	(M45G) 26266B
Land Rover (1971-73)	
4 & 6 Cyl. Gasoline .....	(M418G) 25605D
4 Cyl. Diesel .....	(M45G) 26256E
<b>SUNBEAM</b>	
All Models (1963-69) .....	(M35G) 25079
<b>TRIUMPH</b>	
<b>4 Cylinder Models</b>	
TR4 & TR4A (1963-68) .....	(M418G) 25550
Herald MK I & II (1963-67) .....	(M35G) 25079
Spitfire (1963-69) .....	(M35G) 25079
Spitfire (1970-73) .....	(M35J) 25149
<b>6 Cylinder Models</b>	
2000 Sedan (1965-67) .....	(M35G) 25079
GT6 All Series (1967-73) .....	(M35G) 25079
TR250 (1968) .....	(M35G) 25079
TR250 (1969) .....	(M418G) 25626
TR6 (1969-73) .....	(2M100) 25647, (M418G) 25626
<b>V8 Models</b>	
All Models (1971-73) .....	(M418G) 25627E
① - Ford Part No. 3034E-A (Man. Trans.); 3034E-B (Auto. Trans. and GT).	
② - Ford Part No. 69BB-A.	
③ - Ford Part No. 68BB-A.	

### TESTING

#### PERFORMANCE TESTS

**No Load Test** - With starter on bench and using a good 12-volt battery, connect an ammeter in series to starter. Starter should rotate smoothly. See specifications for RPM, and current draw.

**Lock Test** - To perform lock test, follow instructions and procedures outlined in instruction manual furnished with tester. With starter locked in test stand, and voltage adjusted to specified figure, ammeter reading and starter torque should be as specified (see specifications).

**Cranking Circuit (Voltage Drop)** - Connect negative lead of low range voltmeter to starter terminal and positive lead to positive terminal of battery. Operate starter switch and note voltmeter reading. Connect positive lead of voltmeter to starter commutator end bracket and negative lead to battery negative terminal. Operate starter switch and again note voltmeter reading; the total of these two readings must not exceed .5 volts. An abnormally high reading indicates excessive resistance in starter circuit, therefore, it will be necessary to

# Starters

## LUCAS (Cont.)

check each part of circuit in turn, paying particular attention to solenoid switch connections and all ground connections, including engine grounding strap.

**Cranking Voltage** — *NOTE* — Make this test only after correcting any defects found previously. Disconnect coil primary wire (to prevent engine starting). Connect positive lead of a 0-20V. range voltmeter to starter main terminal and negative lead to a ground point on starter mounting bracket. Crank engine for a few seconds; note voltmeter reading. Starter should crank engine at a good rate of speed and reading should not be less than 9.5 volts.

### OVERHAUL

#### DISASSEMBLY

*NOTE* — Disregard Step 1) when working on inertia drive models.

- 1) Disconnect link between lower solenoid terminal and starting motor yoke. Remove nuts securing solenoid unit. Remove solenoid from drive end bracket, being careful to disengage solenoid plunger from starter drive engagement lever.
- 2) Remove metal band cover, hold back brush springs and remove brushes from their holders. Remove the two through bolts and remove commutator end bracket from yoke.

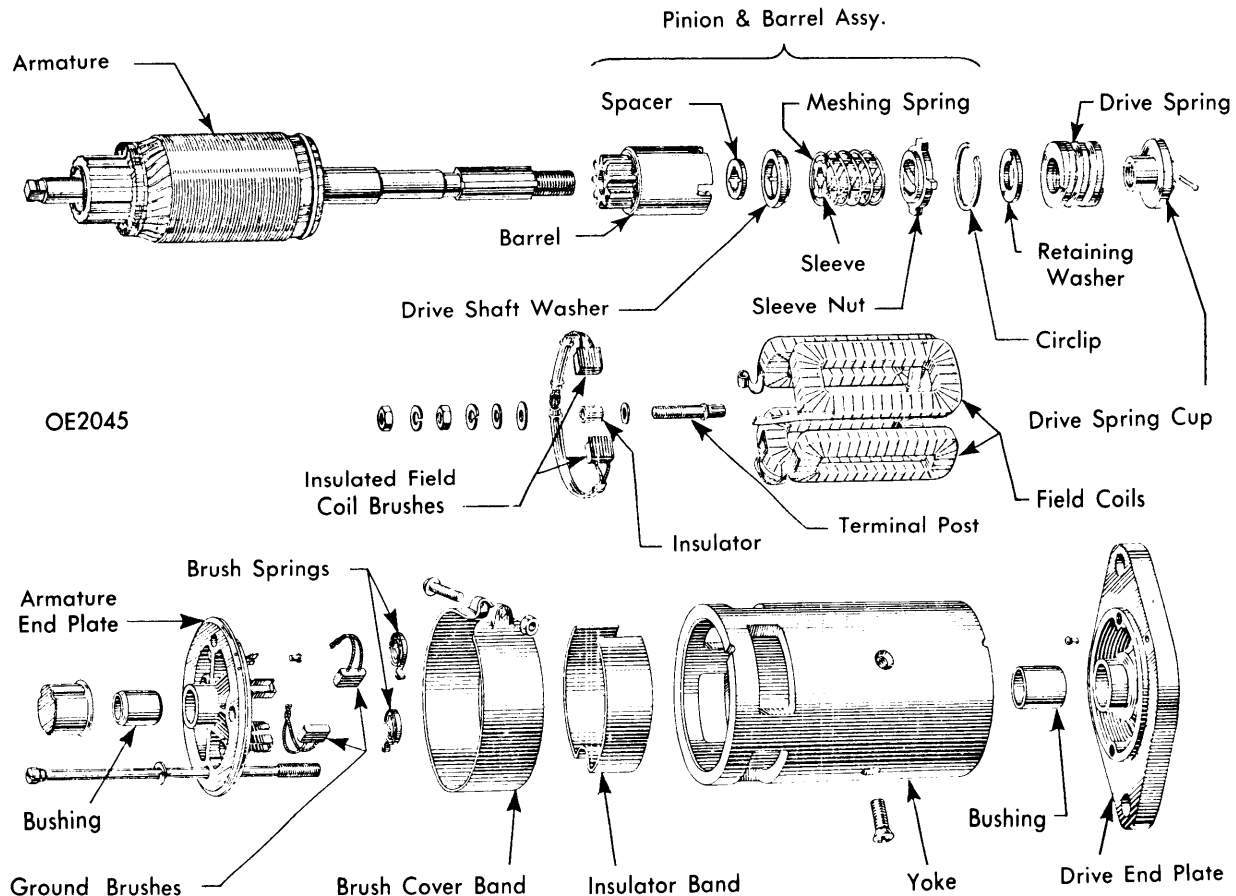
3) On inertia type starters, remove drive end bracket with armature and drive from yoke. If it is necessary to remove drive end bracket from armature, it can be removed after the drive is dismantled.

4) On all other models, extract rubber seal from drive end bracket. Remove nut securing eccentric pin on which drive engagement lever pivots and remove pin. Separate drive end bracket from armature and intermediate bracket assembly. Remove washer from end of armature shaft extension and slide assembly and engagement lever off shaft. Remove intermediate bracket retaining ring from armature shaft extension and slide bracket and brake assembly off shaft.

#### PARTS REPLACEMENT & TESTING

**Armature** — Check armature for open, shorted, or grounded circuits. Check for lifted commutator segments and loose turns in armature winding. A damaged armature must always be replaced and no attempt should be made to machine armature core or to true a distorted shaft. A scored armature may indicate a bent shaft or a loose pole shoe.

**Commutator** — Clean commutator with a cloth moistened in gasoline and if this is not effective, carefully polish with a strip of fine glass paper while rotating armature. To correct a badly worn commutator, disassemble starter as previously described and remove armature from end bracket. Mount armature in a lathe and rotate at high speed, taking a light cut on commutator with a very sharp tool. Do not remove more metal than is absolutely necessary. *NOTE* — Insulators, between commutator segments, must not be undercut.



LUCAS INERTIA TYPE STARTER (TYPICAL)

## LUCAS (Cont.)

**Brushes & Springs** — Check that brushes move freely in holders by holding back brush springs and pulling gently on the flex connectors. If movement is sluggish, remove brush from holder and clean sides with a gasoline moistened cloth. Replace brushes and springs when they have reached minimum specifications in specification table.

Starter Model	Min. Brush Length	Min. Spring Pressure
M3	$\frac{13}{32}$	25 oz.
M325	$\frac{13}{32}$	30 oz.
M35G	$\frac{5}{16}$	35 oz.
M35J	$\frac{3}{8}$	28 oz.
M418G	$\frac{5}{16}$	36 oz.
M45G	$\frac{5}{16}$	30 oz.
M45PE	$\frac{5}{16}$	30 oz.
2M100	$\frac{3}{8}$	36 oz.
3M100	$\frac{5}{16}$	30 oz.

**Field Coils** — Check for open or grounded coils using test lamp or voltmeter and battery, connected in series. If coil is found to be defective, replace all coils as they should not be serviced individually. Mark yoke and pole shoes so shoes may be installed in original position. Remove fiber insulating washers and sleeve from field coil terminal post and remove insulating band from commutator end of yoke. Install a suitable tool (Pole Piece Expander) in starter and expand tool against pole pieces. Remove pole piece screws. Remove field coils and pole pieces from yoke. Carefully unsolder the field coil tapings from terminal post. To install, reverse removal procedure.

**Bushings** — 1) Armature shaft is supported by three bushings. Commutator and driving end brackets each carry a porous bronze bushings, while intermediate bracket carries a graphite-impregnated brass bushing. Bushings which are worn to the extent that they allow excessive side play of the armature must be replaced.

2) The drive end bushing and intermediate bracket bushings can be pressed out. The commutator end bracket bushing is removed by inserting a suitable tap and withdrawing the tap with the bushing attached. New bushings are installed using a shouldered highly polished mandrel of same diameter as shaft to be fitted in the bushing. **CAUTION** — Do not ream bronze bushings, as the porosity of the bushing may be altered.

3) Before installing a new porous bronze bushing, it should be immersed in clean engine oil for 24 hours. This process can be speeded up in case of an emergency, by heating oil to 212°F (100°C) and allowing bushing to soak for two hours. Allow oil to cool before removing bushings from oil.

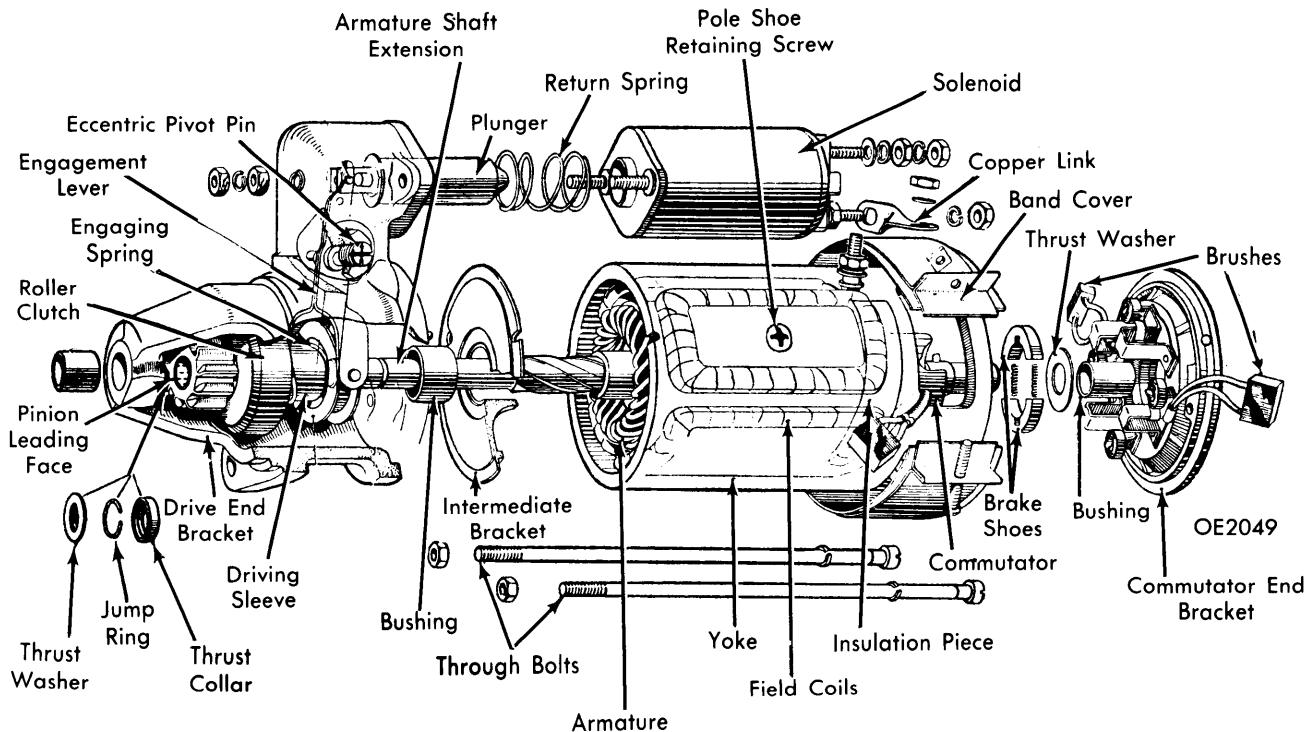
### REASSEMBLY

Clean all parts with a clean cloth and reassemble in the reverse order of disassembly while noting the following:

1) To facilitate installing the solenoid unit to drive end plate, ease drive assembly forward along armature shaft.

2) Set pinion movement before tightening the eccentric pivot pin securing nut. After completing reassembly, connect the small center terminal on the solenoid unit by way of a switch to a 12-volt battery. Connect other side of battery to one of the solenoid studs. Close switch (throwing drive assembly forward into the engaged position) and measure the distance between the pinion and the washer on the armature shaft extension. Make this measurement with the pinion pressed lightly towards armature to take up slack in engagement linkage. Measurement should be .005-.015".

3) To adjust, turn pivot pin until the correct measurement is obtained. The arc of the adjustment is 180° and the arrow on pivot pin should be set between the arrows on the drive end bracket. Tighten pivot pin locking nut.



LUCAS PRE-ENGAGED STARTER (TYPICAL)

# Starters

## LUCAS (Cont.)

STARTER PERFORMANCE SPECIFICATIONS					
Model ①	No Load Test		Lock Test		
	Amps. (Maximum)	RPM	Amps. (Maximum)	Volts	Torque (Minimum)
<b>6 Volt</b>					
M35G (21)	70	8500-9500	400	3.2	6.0 ft. lbs.
M418G (23)	70	5500-6200	510	2.8	10.4 ft. lbs.
M45G (23)	70	4100-4600	500	2.9	13.7 ft. lbs.
<b>12 Volt</b>					
M325 (29)	65	8000-9000	356	7.0	7.5 ft. lbs.
M325 (33)	65	8000-9000	350	7.1	7.8 ft. lbs.
M35G					
Inertia & Pre-Engaged (29)	60	8000-11500	365	7.0	6.7 ft. lbs.
M35J					
Pre-Engaged (37)	60	6500-8500	280	7.0	8.6 ft. lbs.
Inertia (29)	50	8000-10000	365	7.0	6.7 ft. lbs.
Pre-Engaged (29)	65	8000-10000	390	7.0	7.0 ft. lbs.
2M100					
Inertia (29)	40	5200-7000	475	7.0	14.0 ft. lbs.
Pre-Engaged (29)	45	5200-7000	480	7.0	14.0 ft. lbs.
3M100					
Inertia (29)	60	5200-7000	540	7.0	16.5 ft. lbs.
Pre-Engaged (29)	65	5000-7000	545	7.0	16.5 ft. lbs.
M418G					
Pre-Engaged (23)	70	5000-7000	810	6.2	21.5 ft. lbs.
Inertia (37)	70	5500-8000	450	7.2	17.0 ft. lbs.
Pre-Engaged (37)	70	5500-8500	460	7.2	17.0 ft. lbs.
M45G					
Pre-Engaged (23)	100	5000-6000	940	6.5	29.0 ft. lbs.
Inertia (23)	100	5000-6000	930	6.5	29.0 ft. lbs.
Man. Pre-Engaged (23)	100	5000-6000	930	6.5	29.0 ft. lbs.
Pre-Engaged (37)	70	5000-6500	430	6.0	13.5 ft. lbs.
Inertia (37)	70	5800-6500	450	7.2	18.5 ft. lbs.

① — The number in parenthesis (29) indicates the number of slots in armature.