SECTION 4D
Transmission - Gear Box

nut securely and bend over one ear of lock washer against flat of nut.

On 1964 and earlier models, install gasket (4) and end cap (3) with washers (2) and screws (1).

Install gasket (29), drive unit (28), washer (27) and screw (26).

Install shifter cover, starter clutch, starter cover and clutch as described in pertinent sections.

Assemble transmission to motorcycle and connect controls in reverse order of stripping procedure described in "Stripping Motorcycle for Transmission Repair," Section 4A.

DISASSEMBLING GEAR BOX (THREE-SPEED AND REVERSE)

A three forward speed and reverse transmission cannot be installed on a foot shift model motorcycle, and a three-speed transmission cannot be assembled in a four-speed gear case.

The disassembly, repair and assembly procedures for a three-speed and reverse transmission are the same as for a four-speed transmission except for the procedures described in operations to four-speed model and following differences:

Refer to Fig. 4D-12. In three-speed and reverse countershaft assembly, omit shifter clutch (13), lock ring (14), thrust washer (15) and gear bushing (17).

Substitute gear 10A for 10, 16A for 16, and 25A for 25.

Refer to Fig. 4D-13. Substitute 8A for 8 and 10A for 10.

Refer to Fig. 4D-9, Substitute 8A for 8.
94557-55 COMPENSATING SPROCKET SHAFT NUT WRENCH

94635-41 MAINSHAFT BALL BEARING LOCK NUT WRENCH

94645-41 CLUTCH HUB NUT WRENCH

94660-25 COUNTERSHAFT SPROCKET LOCK NUT WRENCH

94825-31 TRANSMISSION MAIN DRIVE GEAR BUSHING REAMER
  Used to size new main drive gear bushing.

95637-46 WEDGE ATTACHMENT FOR CLAW PULLER
  Used in combination with claw puller for pulling close fitting gears or bearings.

95650-42 TRANSMISSION MAINSHAFT STARTER CLUTCH AND BEARING PULLER
  One end used to remove mainshaft starter clutch, the other end for pulling worn mainshaft ball bearing with transmission in or out of chassis.

95660-42 MAIN DRIVE GEAR OIL SEAL TOOL
  Used to remove and install main drive gear oil seal with transmission in or out of chassis.
  Used with clutch gear oil seal tool to remove and install clutch gear oil seal on Electra-Glide Model having longer transmission mainshaft.

95960-41A CLUTCH HUB AND CHAIN HOUSING PULLER
  Four holes fit clutch hub studs, four bolts fit tapped holes in chain housing.

96216-49 INTERNAL LOCK RING PLIERS LARGE
  Special pliers for removing and replacing lock ring.

96384-39 FORK SHIFTER GAGE
  Used to accurately set and align transmission shifter forks.
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WIRING

1959 DUO-GLIDE WIRING DIAGRAM KEY

A. Conduit (four wire) - Red, green, black and yellow
B. Conduit (one wire) - Green
C. Conduit (four wire) - Red, green, yellow and black
D. Handlebar (loose wires) - Red with black tracer, red with yellow tracer, black with red tracer, red with yellow tracer, black and green
E. Conduit (two wire) - Red and green
F. Conduit (three wire) - Black, green and red
G. Conduit (three wire) - Red, green and red
H. Conduit (two wire) - Black with red tracer and red
J. Conduit (two wire) - Red and green
K. Conduit (one wire) - Red
L. Conduit (two wire) - Green and red
N. Conduit (one wire) - Green

1. Switch terminal - 3 Red wires
2. Switch terminal - 2 Green wires
3. Switch terminal - Not used with standard wiring
4. Switch terminal - Green wire
5. Switch terminal - Black and yellow wires
6. Junction terminal - 5 Black wires
7. Junction terminal - Green, yellow wires
8. Speedometer light - Green wire
9. Terminal - Red with black tracer, green wire
10. Terminal - Red wire
11. Terminal - Not used with standard wiring
12. Terminal - Not used with standard wiring
13. Regulator - 2 Red, green wires
14. Tail and stop lamp - Green, red wires
15. Battery positive terminal - Red wire
16. Battery negative terminal - Black wire
17. Oil pressure signal switch - Green wire
18. Handlebar headlamp switch - Red with black tracer, black with red tracer, red with yellow tracer
19. Horn switch - Black, green wires
20. Terminal - Not used with standard wiring
21. Terminal - 2 Black wires with red tracer
22. Terminal - Red wire, red with yellow tracer
23. Terminal - Not used with standard wiring
24. Terminal - 2 Black wires
25. Terminal - Yellow wire
26. Ignition circuit breaker - Black wire
27. Stop lamp switch - Black, red wires
28. Generator signal light - Green, black wires
29. Terminal - Not used with standard wiring
30. Terminal - Not used with standard wiring
31. Terminal - Not used with standard wiring
32. Generator "F" terminal - Green wire
33. Generator "A" terminal - Red and green wires
34. Ignition - Light switch - See terminals 1 thru 5
35. Ignition coil - 2 Black wires
36. Terminal place - See 10 and terminals 20 thru 24
37. Terminal box - See terminals 39 thru 43
38. Terminal - 3 Red wires
39. Terminal - 2 Green wires
40. Terminal - 2 Black wires
41. Terminal - Yellow, green wires
42. Terminal - 2 Red wires
43. Headlamp bracket - Black wire
44. Junction terminal - Black, green wires
45. Neutral indicator light - Black, green wires
46. Neutral indicator switch - Green wire
47. Oil signal light - Black and green wires
48. Horn - Red and green wires
49. Headlamp - Red wire black with red tracer

KEY TO WIRING DIAGRAM (RADIO-SPECIAL)

Wiring with radio equipment is unchanged except for regulator, generator and battery connections.

B. Conduit (one wire) - Green
C. Conduit (two wire) - Red and green
K. Conduit (one wire) - Red
L. Cable (two wire) - Red and green
M. Conduit (one wire) - Red (not shown)

13. Regulator - Green and red wires
32. Generator "F" Terminal - Green wire
33. Generator "A" Terminal - Red wire
39. Terminal - Red wire
49. Fuse
Classic Cycles Technical Resources

WIRING DIAGRAM KEY

A. Conduit (four wire) - Red, green, black and yellow
B. Conduit (one wire) - Green
C. Conduit (four wire) - Red, green, yellow and black
D. Handlebar (loose wires) - Red with black tracer, black with red tracer, red with yellow tracer, black and green
E. Conduit (two wire) - Red and green
F. Conduit (three wire) - Black, green and red
G. Conduit (three wire) - Red, green and red
H. Conduit (three wire) - Black, white and yellow
J. Conduit (two wire) - Red and green
K. Conduit (one wire) - Red
L. Conduit (two wire) - Green and red
N. Conduit (one wire) - Green

1. Switch terminal - 3 Red wires
2. Switch terminal - 2 Green wires
3. Switch terminal - Not used with standard wiring
4. Switch terminal - Green wire
5. Switch terminal - Black and yellow wires
6. Junction terminal - 5 Black wires
7. Junction terminal - Green, yellow wires
8. Speedometer light - Green wire
9. Terminal - Red with black tracer, green wire
10. Terminal - Red wire
11. Terminal - Not used with standard wiring
12. Terminal - Not used with standard wiring
13. Regulator - 2 Red, green wires
14. Tail and stop lamp - Green, red wires
15. Battery positive terminal - Red wire
16. Battery negative terminal - Black wire
17. Oil pressure signal switch - Green wire
18. Handlebar headlamp switch - Red with black tracer, black with red tracer, red with yellow tracer
19. Horn switch - Black, green wires
20. Terminal - Not used with standard wiring
21. Terminal - 2 Black wires with red tracer
22. Terminal - Red wire, red with yellow tracer
23. Terminal - Not used with standard wiring
24. Terminal - 2 Black wires
25. Terminal - Yellow wire
26. Ignition circuit breaker - Black wire
27. Stop lamp switch - Black, red wires
28. Generator signal light - Green, black wires
29. Terminal - Not used with standard wiring
30. Terminal - Not used with standard wiring
31. Terminal - Not used with standard wiring
32. Generator "F" terminal - Green wire
33. Generator "A" terminal - Red and green wires
34. Ignition - Light switch - See terminals 1 through 5
35. Ignition coil - 2 Black wires
36. Terminal plate - See terminals 20 through 24
37. Terminal box - See terminals 39 through 43
38. Terminal - 3 Red wires
39. Terminal - 2 Green wires
40. Terminal - 3 Black wires
41. Terminal - Yellow, green wires
42. Terminal - 2 Red wires
43. Terminal plate top mounting screw (ground)
44. Junction terminal - Black, green wires
45. Neutral indicator light - Black, green wires
46. Neutral indicator switch - Green wire
47. Oil signal light - Black and green wires
51. Horn - Red and green wires
52. Headlamp - Black, white and yellow wires

KEY TO WIRING DIAGRAM (RADIO-SPECIAL)

Wiring with radio equipment is unchanged except for regulator, generator and battery connections.

B. Conduit (one wire) - Green
G. Conduit (two wire) - Red and green
K. Conduit (one wire) - Red
L. Cable (two wire) - Red and green
M. Conduit (one wire) - Red (not shown)

13. Regulator - Green and red wires
32. Generator "F" terminal - Green wire
33. Generator "A" terminal - Red wire
39. Terminal - Red wire
49. Fuse

Revised: 7-64
**WIRING**

**1961-64 DUO-Glide**

**WIRING DIAGRAM KEY**

- A. Conduit (four wires) - Red, green, black and yellow
- B. Conduit (one wire) - Green
- C. Conduit (four wire) - Red, green, yellow and black
- D. Handlebar (loose wires) - Red with black tracer, black with red tracer, red with yellow tracer, black and green
- E. Conduit (two wire) - Red and green
- F. Conduit (three wire) - Black, green and red
- G. Conduit (three wire) - Red, green and red
- H. Conduit (three wire) - Black, white and yellow
- J. Conduit (two wire) - Red and green
- K. Conduit (one wire) - Red
- L. Conduit (two wire) - Green and red
- N. Conduit (one wire) - Green

1. Switch terminal - 3 Red wires
2. Switch terminal - 2 Green wires
3. Switch terminal - Not used with standard wiring
4. Switch terminal - Green wire
5. Switch terminal - Black and yellow wires
6. Junction terminal - 5 Black wires
7. Junction terminal - Green, yellow wires
8. Speedometer light - Green wire
9. Terminal - Red with black tracer, green wire
10. Terminal - Red wire
11. Terminal - Not used with standard wiring
12. Terminal - Not used with standard wiring
13. Regulator - 2 Red, green wires
14. Tail and stop lamp - Green, red wires
15. Battery positive terminal - Red wire
16. Battery negative terminal - Black wire
17. Oil pressure signal switch - Green wire
18. Handlebar headlamp switch - Red with black tracer, black with red tracer, red with yellow tracer
19. Horn switch - Black, green wires
20. Terminal - Not used with standard wiring
21. Terminal - 2 Black wires with red tracer
22. Terminal - Red wire, red with yellow tracer
23. Terminal - Not used with standard wiring
24. Terminal - 2 Black wires
25. Terminal - Yellow wire
26. Ignition circuit breaker - Black, yellow wires
27. Stop lamp switch - Black, red wires
28. Generator signal light - Green, black wires
29. Terminal - Not used with standard wiring
30. Terminal - Not used with standard wiring
31. Terminal - Not used with standard wiring
32. Generator "P" terminal - Green wire
33. Generator "A" terminal - Red and green wires
34. Ignition light switch - See terminals 1 through 5
35. Ignition Coil Front Cylinder - Yellow wire
36. Ignition Coil Rear Cylinder - 2 Black wires
37. Terminal plate - See 10 and 20 through 24
38. Terminal box - See terminals 39 through 43
39. Terminal - 3 Red wires
40. Terminal - 2 Green wires
41. Terminal - 3 Black wires
42. Terminal - Yellow, green wires
43. Terminal - 2 Red wires
45. Terminal plate top mounting screw (ground)
46. Junction terminal - Black, green wires
47. Neutral indicator light - Black, green wires
48. Neutral indicator switch - Green wire
50. Oil signal light - Black and green wires
51. Horn - Red and green wires
52. Headlamp - Black, white and yellow wires

**7. KEY FOR WIRING DIAGRAM (RADIO - SPECIAL)**

Wiring with radio equipment is unchanged except for regulator, generator and battery connections.

- B. Conduit (one wire) - Green
- G. Conduit (two wire) - Red and green
- K. Conduit (one wire) - Red
- L. Cable (two wire) - Red and green
- M. Conduit (one wire) - Red (not shown)

13. Regulator - Green and red wires
32. Generator "P" Terminal - Green wire
33. Generator "A" Terminal - Red wire
39. Terminal - Red wire
49. Fuse
Figure 5B-10. 1961-64 Duo-Glide Wiring Diagram
### Wiring Diagram Key

- **A.** Conduit (four wire) - Red, green, black and yellow
- **B.** Conduit (one wire) - Green
- **C.** Conduit (four wire) - Red, green, yellow and black
- **D.** Left handlebar (loose wires) - Red with black tracer, black with red tracer, red with yellow tracer, 2 black wires
- **E.** Right handlebar (loose wires) - 2 black wires
- **F.** Conduit (two wire) - 2 red wires
- **G.** Conduit (one wire) - Yellow
- **H.** Conduit (three wire) - Black, white and yellow
- **J.** Conduit (two wire) - Red and green
- **K.** Conduit (one wire) - Red
- **L.** Conduit (two wire) - Green and red
- **M.** Conduit (one wire) - Black
- **N.** Conduit (one wire) - Black
- **O.** Conduit (one wire) - Black
- **P.** Conduit (two wires) - 2 black wires
- **Q.** Conduit (one wire) - Red

1. Switch terminal - Switch supply
2. Switch terminal - Headlamp
3. Switch terminal - Not used with standard wiring
4. Switch terminal - Tail lamp
5. Switch terminal - Ignition coil
6. Ignition - Light switch - See terminals 1 through 5
7. Junction terminal
8. Junction terminal
9. Terminal
10. Terminal
11. Terminal - Not used with standard wiring
12. Terminal - Not used with standard wiring
13. Regulator
14. Tail and stop lamp
15. Battery positive terminal
16. Battery negative terminal
17. Oil pressure signal switch
18. Handlebar headlamp switch
19. Horn switch
20. Terminal - Not used with standard wiring
21. Terminal
22. Terminal
23. Terminal - Not used with standard wiring
24. Terminal
25. Terminal
26. Ignition circuit breaker
27. Stop lamp switch
28. Generator signal light
29. Terminal - Not used with standard wiring
30. Terminal - Not used with standard wiring
31. Terminal
32. Generator "F" terminal
33. Generator "A" terminal
34. Starter solenoid
35. Starter motor
36. Ignition Coil
37. Terminal plate
38. Terminal box - See terminals 39 through 43
39. Terminal
40. Terminal
41. Terminal
42. Terminal
43. Terminal
44. Speedometer light
45. Terminal plate top mounting screw (ground)
46. Headlamp
47. Neutral indicator light
48. Neutral switch
49. Starter button
50. Oil signal light
51. Horn
52. Circuit breaker

**Revised:** 9-68
Figure 5B-22. 1965-67 Electra-Glide Wiring Diagram
WIRING
1968-69 ELECTRA-GLIDE

WIRING DIAGRAM KEY

A. Conduit (four wire) - red, green, black and yellow
B. Conduit (one wire) - green
C. Conduit (four wire) - red, green, yellow and black
D. Left handlebar (loose wires) - red with black tracer, black with red tracer, red with yellow tracer, 2 black wires
E. Right handlebar (loose wires) - red, green, brown, 2 black wires
F. Conduit (one wire) - red
G. Conduit (one wire) - yellow
H. Conduit (three wire) - black, white and yellow
J. Conduit (two wire) - red and green
K. Conduit (one wire) - red
L. Conduit (two wire) - green and red
M. Conduit (one wire) - black
N. Conduit (one wire) - black
O. Conduit (one wire) - black
P. Conduit (two wire) - 2 black wires
Q. Conduit (one wire) - red
R. Conduit (one wire) - red
S. Conduit (one wire) - green
T. Conduit (two wire) - red and green

1. Switch terminal - switch supply
2. Switch terminal - headlamp
3. Switch terminal - not used with standard wiring
4. Switch terminal - tail lamp
5. Switch terminal - ignition coil
6. Ignition - light switch - see terminals 1 through 5
7. Junction terminal
8. Junction terminal
9. Terminal
10. Terminal
11. Terminal
12. Terminal - not used with standard wiring
13. Regulator
14. Tail and stop lamp
15. Battery positive terminal
16. Battery negative terminal
17. Oil pressure signal switch
18. Handlebar headlamp switch
19. Horn switch
20. Terminal
21. Terminal
22. Terminal
23. Terminal
24. Terminal
25. Terminal
26. Ignition circuit breaker
27. Stop lamp rear switch
28. Generator signal light
29. Terminal - not used with standard wiring
30. Terminal - not used with standard wiring
31. Terminal
32. Generator "F" terminal
33. Generator "A" terminal
34. Starter solenoid
35. Starter motor
36. Ignition coil
37. Terminal plate
38. Terminal box - see terminals 39 through 43
39. Terminal
40. Terminal
41. Terminal
42. Terminal
43. Terminal
44. Speedometer light
45. Terminal plate top mounting screw (ground)
46. Headlamp
47. Neutral indicator light
48. Neutral switch
49. Starter button
50. Oil signal light
51. Horn
52. High beam indicator lamp
53. Overload circuit breaker
54. Starter relay
55. Direction signal switch
56. Direction signal flasher
57. Left front direction lamp
58. Right front direction lamp
59. Left rear direction lamp
60. Right rear direction lamp
61. Left direction signal pilot lamp
62. Right direction signal pilot lamp
63. Stop lamp front switch
64. Connector

Revised: 3-69
SWITCHES

IGNITION-LIGHT SWITCH

The switch located in the center of the instrument panel below the "GEN" and "OIL" indicator lamps is a combination ignition-light switch. It has three positions plus a center-off position. One notch counterclockwise illuminates parking lights only. The first notch or click clockwise from the center-off position is ignition only while the second click is running lights and ignition.

It is not necessary to keep the key inserted in the lock to operate the switch after it has been unlocked. The switch can be locked only in the "off" and "parking lights" position.

DISASSEMBLING IGNITION LIGHT SWITCH

On Duo-Glide and Servi-Car Models remove instrument panel cover by prying out side-cover clip located at trip mileage set knob and turning out mounting base center screw located in the center of instrument panel below speedometer. On Model 165 remove switch bezel to expose switch.

Disconnect all wires connected to switch terminals and remove four switch mounting screws.

See Fig. 5C-1. All directions for disassembly apply with switch in an inverted position. Switch must be in "off" position and unlocked.

Grasp end of roller contact*retainer with pliers and simultaneously move it upward and away from roller contact (1). Lift off roller contact and switch mounting plate assembly (2). Notice that this plate is positioned with the three-terminal side away from lock cover hinge.

Reinforcing plate (3) with contact bar holder (4) and roller contact retainer (5) can be removed from switch cover by slipping part assembly sideways until one set of tabs clears slot in switch cover, then lifting and sliding assembly the opposite direction to clear other tab.

Switch base (7) and lock plate (6) can be removed from switch cover. Note that narrow end of elongated hole in lock, and lug on switch lock (8) which fits into hole in lock plate, are toward lock cover hinge.

Lock assembly (8 and 9) can now be lifted out of switch cover (10). Avoid separating switch cylinder from its case unless lock is faulty. On some models the lock cylinder and case are a single unit.

CLEANING, INSPECTION AND REPAIR

Wash all parts in cleaning solvent and dry with compressed air.

Inspect all parts, particularly roller contact and plate assembly for excessive wear of contacting brass buttons and roller surfaces. Extreme wear of these parts may allow head of roller contact retainer to short against switch lock plate. Loosened terminals on switch mounting plate may also cause a short...
SECTION 5C
Electrical - Switches

or an inconsistent positive contact. Replace all worn or rusted parts.

ASSEMBLING IGNITION LIGHT SWITCH

Apply a light coat of grease to head of roller contact retainer, lock plate, roller contact and contact buttons on switch mounting plate.

Assemble parts in reverse order of disassembly. If lock cylinder had to be removed from case for repair or replacement, it must be replaced in correct position or switch cannot be locked. To reassemble correctly, insert lock cylinder into housing with tumblers in any one of the four registers. While pressing cylinder into housing with fingertip, insert key and turn clockwise as far as possible. Remove key and complete assembly.

BUTTON SWITCH

This type switch is used for momentary closing of circuits to horn, magneto or starting motor and is located on handlebar. Terminal has either one or two wires. Two types of switches are in use (early and late type). See Figure 5C-1A.

---

**Figure 5C-1A. Button Switches - Exploded View**

---

DUO-GLIDE - SPORTSTER
SERVI-CAR - 165

To disassemble the early type switch, remove screws (1) to free housing. Remove terminal assembly (2) from housing (3) with a screwdriver. Remove spring (4), contact plate (5), and button (6) from the housing.

To replace the early type switch wires, unsolder the old wires and solder new wires onto the terminal assembly. Assemble in reverse order of disassembly.

To disassemble late type switch, remove screws (1) from housing. Pull remaining parts from housing as an assembly.

To replace the switch wires, unsolder or cut wires from contacts. The wire ends should have about 1/4 inch of insulation stripped off.

Lead one wire through cup, lower contact, plastic washer and spring to upper contact. Be sure parts are arranged as shown. Insert one wire end through center of upper contact, spread strands out flat over contact and solder. Lead second wire through cup and solder to lower contact.

Insert button and assembled parts in housing and re-install switch on handlebar.

HEADLAMP DIMMER AND HORN SWITCH

This type switch has the headlamp dimmer switch and horn button combined in one unit located on the handlebar. High and low beams are operated with flip switch. Button operates horn. See Figure 5C-1B.

To disassemble switch, remove clamping screws (1) and separate parts of switch: cover (2), switch (3), and base (4). Remove wires (5) from switch by loosening terminal screws (6).

---

**Figure 5C-1B. Dimmer and Horn Switch Exploded View**

---

Check switch for wear, and replace switch if it will not stay in high or low beam position. Check spring tension on horn button.

Replace worn or broken parts with a new switch or base. Clean terminals and reassemble in reverse order. Be careful not to over-tighten clamp screws or plastic body may crack.

Revised: 10-65
TRANSMISSION NEUTRAL SWITCH

This switch is threaded into the transmission top cover. Switch plunger is depressed by a nut on the shifter drum or shifter gear only when the transmission is in neutral to complete the circuit. A variable number of spacing washers are used to close the circuit only when transmission is in neutral. Switch is permanently assembled and if it fails to close the circuit when operating plunger is depressed, it must be replaced.

Solenoid Switch

Solenoid switches are designed to close and open electrical circuits electro-magnetically. Switches of this type consist basically of contacts and a winding around a hollow cylinder containing a movable plunger. When the winding is energized by the battery through an external control circuit, the magnetism produced pulls the plunger into the coil. The contact disc attached to the plunger moves against two main switch contacts closing the circuit.

Figure 5C-1C. Neutral Switch

The 1964-65 Servi-car solenoid switch is permanently assembled. Repair parts are not sold. If this switch becomes defective, it must be replaced. The control circuit wires are connected to small terminals. The motor and battery circuit wires are connected to heavy terminals.

The Electra-Glide 1967 Sportster, and 1966 Servi-car solenoid switch individual parts are replaceable as shown in exploded view, Figure 5C-1E, below. The control circuit wire from handlebar starter button is connected to small terminal stud. Battery cable must be connected to the large, longest stud and starter motor cable is connected to the large, shorter stud. If cables are reversed, solenoid coils will remain in circuit and drain battery. See solenoid internal wiring diagram, Figure 5C-1G.
SECTION 5C

TESTING SOLENOID SWITCHES

When it is suspected that a solenoid switch is defective, tests should be made of the solenoid coil winding and continuity through the main switch when contacts are in closed position. Using the test circuit described, these two tests can be made simultaneously.

With solenoid disconnected from control circuit, battery and motor, make test circuit connections as follows: (See Figure 5C-1D or 5C-1F).

Since solenoid coil requires 12 V. to actuate plunger closing main switch contacts, use a 12-volt battery. Leads A and B are connected to terminals 1 and 2 (coil terminals) to actuate solenoid. A sharp click should be heard from the solenoid switch when making this connection. No click or a heavy spark at the terminals when connecting wires would indicate either an open or short in the solenoid winding and solenoid switch must be replaced. If the solenoid winding checks good and plunger does close main switch contacts, there is still a possibility contacts are badly burned or eroded and will not pass heavy current.

To test continuity on the main contacts, leave 12 V. leads connected to terminals 1 and 2, connect a test bulb of a least 21 CP (12 V.) to terminals 1 and 3. (On servi-car solenoid connect terminals 2 and 4 with a jumper wire.) A bright glow of the test bulb indicates main switch contacts are passing current.

![Figure 5C-1F. Test Circuit for Electra-Glide, 1967 Sportster and 1966 Servi-car Solenoid](image)

![Figure 5C-1G. Solenoid Internal Wiring Diagram - Electra-Glide, 1967 Sportster and 1966 Servi-car](image)

STARTER RELAY SWITCH

Starter relay switch for late 1967 Electra-Glide models is a sealed unit and is not repairable. If test shows unit to be defective it must be replaced.

Figure 5C-1E shows a test circuit using a 12-volt battery and stop lamp bulb. Contacts should close and bulb should light when connection is made at positive post of battery and should go out when connection is broken.

STOP LAMP FRONT BRAKE SWITCH

This is a mechanical, normally-closed plunger type switch which closes the stoplight circuit when the front brake hand lever is operated. Repair parts for the switch are not available - it must be replaced as a unit.

STOP LAMP REAR BRAKE SWITCH

This is a hydraulic, normally-open switch, which is located in the rear hydraulic brake line, and closes the circuit when the rear brake is applied.

![Figure 5C-1E. Starter Relay Internal Wiring Diagram and Test Circuit](image)
HEADLAMP

DUO-GLIDE, SPORTSTER AND SERVI-CAR

The headlamp is a sealed-beam type, specially designed and made for Harley-Davidson motorcycles. When replacement is required, use only the prescribed sealed-beam unit. Do not attempt to use an automobile sealed-beam unit because the current requirements for a motorcycle are much less than for an automobile and damage to battery or generator will result. If either filament burns out, or the lens breaks, the entire unit must be replaced. Do not attempt to repair a defective sealed-beam unit because when the seal is broken the reflector tarnishes and poor light and road visibility result.

DUO-GLIDE AND SERVI-CAR

Loosen door screw enough to remove headlamp door. Remove three retaining ring screws and retaining ring.

NOTE: Late models may have spring hooked into retaining ring hole - unhook spring to free retaining ring.

The sealed-beam unit is now free from the headlamp body, and connector block can be removed from the unit by pulling connector block from the unit prongs.

Assembly is the reverse order of disassembly. Make sure connector block contacts are clean to ensure good electrical contact.

To replace the entire headlamp on 1959 models remove a back panel and disconnect two lamp wires leading to terminal plate. Remove headlamp fastening nut and free lamp from motorcycle. On 1960 models remove 6 slotted screws holding headlamp body to housing.

SPORTSTER

1966 and Earlier XLH

Loosen headlamp mounting nut located beneath headlamp housing with socket wrench and move headlamp back so screw located on lower periphery of headlamp door is accessible with a screwdriver. Remove screw, simultaneously lift and swing unit up and free from headlamp body. Pull connector block from sealed-beam unit prongs. Pry retaining springs from headlamp door grooves to free sealed-beam unit from rim.

Assembly is the reverse order of disassembly. Be sure connector block contacts are clean to ensure a good electrical contact. After final assembly, readjust headlamp as described under "Beam Adjustment."

BEAM ADJUSTMENT

To get the greatest efficiency from the headlamp and to meet the requirements of the law, correctly adjust headlamp beam according to the following instructions.

1967 and Later XLH and XLCH

To remove sealed beam unit, remove screw from door or clamping ring. Pry unit from rubber mounting and pull connector block from unit prongs. Headlamp mounting nut is located under snap plug on mounting bracket.

To aim beam, loosen the headlamp mounting nut and position the lamp to correctly adjust the beam of light in relation to the horizontal line. At the same time, turn the headlamp right or left to direct the beam of light straight ahead. Tighten the clamp nut after the lamp is correctly adjusted and install remaining fork parts.

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The lamp can be tilted up or down to aim it in relation to the horizontal line by turning vertical adjusting screw in or out. The lamp can be aimed to the right or left in relation to the front wheel by turning the horizontal adjusting screw in or out.

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<table>
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GENERATOR

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GENERATOR

STANDARD GENERATOR

The standard generator is a direct current two pole,two-brush unit with charging rate governed entirely by a voltage regulator. The regulator functions to increase charging rate when the battery charge is low or current is used, to prevent charging when the battery is near full charge.

CHECKING GENERATOR

It is possible to troubleshoot faulty generator without removing the generator from the engine, or, if necessary, to remove it, without completely disassembling the generator. When a generator stops charging or not charging at a satisfactory rate as evidenced by a "dead" battery or signal light on switch panel, it is recommended that the trouble be corrected. If the trouble is known definitely, the following checking sequence be used:

On installations employing a fuse in the generator field circuit, remove fuse at regulator and examine it to see if it has blown. When replacing fuse be sure insulating sleeve is in good condition and covers fuse properly.

Make certain the generator signal light circuit is not grounded. Remove the wire or wires from the generator “A” terminal and position so contact is not made with motorcycle. Turn ignition on. If generator light on instrument panel goes on, light circuit is grounded and may be reason for the generator not charging. If this circuit is grounded this condition must be corrected. If the generator signal light circuit tested O.K. or if a grounded condition has been corrected, proceed to testing generator output.

TESTING GENERATOR OUTPUT (See wiring diagram following)

Remove wire from “F” terminal of generator. Connect a short jumper wire from generator “F” terminal to ground on motorcycle. Remove wire or wires from generator “A” terminal and connect the positive lead of a 0-30 amperes ammeter. Start engine and run at a speed of 2000 RPM (approximately 40 MPH). Then momentarily connect negative lead of ammeter to motorcycle battery positive terminal. (Battery should be known to be good.) If the ammeter reads 15 amperes or more for a 6-volt generator or 10 amperes or more for a 12-volt generator, generator is not at fault. Therefore, the difficulty is in the regulator or wiring circuit. (See Voltage Regulator Section 5I). If generator shows no charge or charge below minimum rate, it must be removed for further checking.

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Remove regulator from generator. Remove black or green wire from "F" terminal and red wire from "A" terminal on generator.

Remove generator from chassis out left side of motorcycle.

SERVI-CAR. Disconnect wires from generator "F" and "A" terminals. Remove two long screws through timing gear case and remove generator to left side of chassis, depressing clutch pedal to allow generator to pass.

INSPECTING BRUSHES (Fig. 5E-1)
Inspect brushes to make certain they are not worn out, broken or gummy and sticking in brush holders.

Remove commutator end cover nuts (7), washers (8), and frame screws (9).

Pry or gently tap commutator end cover (10) off frame and armature shaft. Remove brush holder mounting plate (15) from frame. Disconnect both black brush wires and generator positive brush cable from brush holder terminals.

Remove brushes from brush holders and clean brush holders with cleaning solvent. Blow dry with compressed air. Replace brushes when longest side of brush measures 1/2 in. or less. Seat new brushes with a brush seating stone.

TESTING FIELD COILS

Internal connections of generator field coils to brushes and terminals are shown in Fig. 5E-2.

1955 MODEL 65-12V,
1964 MODEL 64-12V,
1958 - 1964 MODELS 58 & 61-6V.

Figure 5E-2. Generator Wiring Diagrams

Arrange an ammeter and battery in series with test points connected to leads. NOTE: All 12-volt generators are stamped "12V" following model No. on frame. Use a 6 volt battery for testing 6-volt generators or a 12 volt battery for testing 12-volt generators. During all tests be particularly careful to avoid overloading or shorting ammeter. An overload is indicated by the needle going beyond range of calibrated scale. A direct short is indicated by needle swinging violently to extreme limit of its travel. In either case, contact must be broken instantaneously to avoid damaging the ammeter. In making the following tests, first make only a flicking, momentary contact to determine if a short is present. If ammeter needle does not go beyond calibrated scale, it is safe to make continuous contact. As added precaution, work on a bench with a nonconductive top. Never touch test points together.

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TEST PROCS

Figure 5E-3. Checking Armature for Grounded Winding

1. Remove brushes or insulate brushes from commutator. Touch one test lead to "F" terminal and the other to any part of the generator frame. There should be no reading. Move first terminal lead to "A" terminal. A reading at either contact indicates a terminal or field coil is grounded to frame. If no reading was obtained, follow further disassembly procedure and eliminate step 2.

Remove generator drive gear using Gear Puller, Part No. 55715-16A.

Press armature out of ball bearing with arbor press and remove. Disassemble terminals, remove field coil leads, inspect terminal components for cracked or worn through insulating materials and, if parts appear serviceable, reassemble terminal components eliminating field coil leads.

2. Recheck terminal to ground contacts as described in step 1. No reading indicates terminals are properly insulated. If reading was obtained in step 1, but not in step 2, field coils are probably grounded.

3. Touch one test lead to either field coil lead and the other to the generator frame. A reading indicates a field coil is grounded and it is necessary to clip the connection between the field coils. Touch test leads to one field coil lead and ground. Repeat process on other coil. A reading indicates a grounded coil which will have to be replaced. If terminals and field coils are in serviceable condition, proceed to step four.

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4. Test field coils, using 6 volt battery for 6 volt generator and 12 volt battery for 12 volt generator, touching test leads to coil lead terminals. Current values should be as follows for double coil: 2 amp. on 6 volt coils, 1.9 amp. on 1964 model 12 volt coils and 2.3 amp. on 1965 model 12 volt coils. No reading indicates an open coil, a higher reading indicates a shorted coil.

5. Strip back the insulation at point where two field coil leads are joined and file the insulating varnish off a spot on the splice. Connect one test lead at this point, the other at either coil lead. Without moving first test lead, move second test lead to opposite free lead. Current values should be as follows: 4 amperes for 6 volt coil, 1.9 amperes for 1964 model 12 volt coil, and 4.6 amperes for 1965 model 12 volt coil. No reading indicates an open coil, a higher reading indicates a shorted coil. Faulty parts must be replaced.

6. Touch one test lead to brush holder mounting plate, the other to positive (insulated) brush holder. A reading indicates a shorted holder. Clean thoroughly and recheck. If reading is obtained, replace brush holder mounting plate. Check negative brush holder to be sure it is tight and well grounded.

If field coils, brush holders and generator terminals are serviceable, the trouble is probably in the armature.

Do not remove pole shoes and field coils unless tests previously made proved one or both of the coils to be faulty. When a pole shoe must be removed to replace a field coil, follow the procedure described in "Disassembling Generator."

Figure 5E-4. Testing Armature for Short

Figure 5E-5. Testing Armature for Open Circuit

TESTING ARMATURE

TEST FOR GROUND. If growler with test leads is available, test by touching armature core with one test lead and commutator segments, individually, with the other. If this means of testing is not available, test with battery, ammeter and leads as used for testing field coils. Contact commutator segments with one test point and armature core with the other. If circuit is completed, armature is grounded. See Fig. 5E-3.

If armature is found to be grounded, make sure commutator is free from carbon and copper dust deposits. After cleaning thoroughly between segments and at ends of commutator and blowing dry with compressed air, repeat test. Armature must be replaced if ground is still present.

TEST FOR SHORT. Place armature in growler and hold piece of hacksaw blade parallel to and in loose contact with armature core. Turn growler on. Rotate armature slowly several turns. The hacksaw blade will be attracted to the armature core and will vibrate at one or more points if armature is shorted. See Fig. 5E-4.

If short is found, clean commutator segments as described above under "Test for Ground." If short still exists, armature must be replaced.

TEST FOR "OPEN." Place armature in growler. Turn growler on. Insert tip of hacksaw blade between commutator segments that are in horizontal alignment with top of growler "V" shaped cradle. Make and break contact between segments with hacksaw blade. A strong flash should be seen as contact is broken. No flash or a weak flash indicates an open circuit. See Fig. 5E-5.

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Repeat the test between all segments, turning the armature so each test is made in the same position relative to the growler. If an open circuit is found, check for loose or broken wires at commutator connections. If none are found that may be repaired, armature must be replaced. All soldering should be done with rosin flux.

REPAIRING COMMUTATOR

A generator that has been in extended service may fail to deliver enough current to keep the battery in a charged condition although its field coil and armature windings are in serviceable condition. In such cases the commutator and/or brushes are usually at fault. If the commutator has been worn down until the mica separations between segments are no longer undercut or recessed, the commutator probably is grooved noticeably in path of brush travel and no slot between commutator segments exists, causing the brushes to ride high and make only intermittent contact with commutator.

The commutator may be turned down in a lathe and sanded with fine sandpaper until true and smooth. Mount armature in lathe on its bearing seats not on shaft centers. Never sand a commutator with emery cloth. Particles will imbed themselves in the copper surface, holding the brushes off the commutator far enough to cause heavy arcing and burning.

After commutator has been turned down, the mica insulation between segments must be recessed or undercut approximately .025 in. Undercutting is usually done with a special undercutting machine. If one is not available, satisfactory undercutting may be done with a piece of hacksaw blade. Carefully thin down blade width, if necessary, until offset saw teeth are the same width as slots in commutator. Slots must be square-bottomed for good results. See Fig. 5E-6.

Sand commutator surface on lathe and repeat growler test to be sure there are no copper particles between segments.

Open circuited armatures can often be repaired. The break or opening in the circuit usually occurs at the commutator riser bars, a result of overloading the generator which causes overheating and the melting of solder at the joint. Resolder the leads in the riser bars using rosin flux. Turn down commutator and sand to remove any burn spots as described in previous paragraph.

POLARIZING GENERATOR

Assemble generator as described in "Assembling Generator." After a generator has been repaired, it must be repolarized to make sure that it has the correct polarity for charging in the right direction.

Figure 5E-6. Recessing Mica Separators

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A generator that is put into service with the wrong polarity may result in burned relay points, a dead battery and damage to the generator.

Polarize the generator by momentarily connecting the "BAT" and "GEN" terminals with a jumper wire.

GENERATOR CHARGING RATE

After a generator has been repaired, assembled and installed on motorcycle, connected and polarized, it may be checked for maximum output. That is, the maximum, uncontrolled amperage output range may be checked to determine the success of the repair work. This test is described in previous paragraph "TESTING GENERATOR OUTPUT". This test will not, however, indicate if the battery and generator are being protected by proper regulator function. See "Voltage Regulator," Section 5I, for correct Delco Remy Bulletin giving checks that can be made to determine if the regulator is functioning normally.

DISASSEMBLING GENERATOR (Fig. 5E-1)

Remove generator from engine gearcase as described in "Removing Generator."

Remove gasket (1), remove gear shaft nut (2) and washer (3). Remove generator drive gear (4 or 4A) using Gear Puller, Part No. 95715-19A or All Purpose Claw Puller, Part No. 95635-46, and Wedge Attachment, Part No. 95637-46. Slip drive end oil deflector (5) from armature shaft.

Remove brush cover strap (6). Turn off commutator end cover nuts (7) and remove washers (8). Pull frame screws and washers (9) out of frame. Tap commutator end cover (10) gently with small mallet and remove. Remove nuts (11) and washers (12) to free positive brush cable and brush leads. Remove brush holder mounting plate (13).

Press armature (14) out of bearing on armor press or by clamping generator frame between copper jaws in vise and tapping gear drive shaft end with rawhide mallet.

Remove terminal screw nuts (15), lock washers (16) and insulating washers (17). Remove terminal screws (22 and 24) from inside generator frame and remove them terminal insulator (18), terminal bolt clip (19), terminal screw bushings (20), bracket insulator (21) and positive brush cable (23).

Tap drive end plate (28) from frame and remove bearing retainer (25) using needle nose pliers. Press armature bearing (26) out of drive end plate using arbor press and appropriate drift pin. Remove bearing retainer (27). Press armature oil seal (29) out of drive end plate from drive gear side.

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Remove two pole shoe screws (30). Use large, heavy, screwdriver. Screws are turned extremely tight. Remove pole shoes (31) and field coils (32) from frame (33). Do not remove pole shoe screws, pole shoes and field coils unless necessary to replace faulty parts.

CLEANING, INSPECTION AND REPAIR (Fig. 5E-1)

Clean all parts except gasket, armature, field coils and brushes in cleaning solvent and blow dry with compressed air. Wipe rest of parts clean with cloth dampened in white gas and blow dry with compressed air.

Examine all parts carefully for wear. Give close attention to condition of insulators, armature windings, field coil wrapping and surfaces of pole shoes nearest armature. If armature had oily appearance before cleaning, replace oil seal. Replace any part of brush holder mounting assembly that is bent. Disassemble parts as far as necessary in order of numbers shown in Fig. 5E-1, lowest number first.

Check play in armature ball bearing. If any play can be detected, replace part.

Check fit of armature shaft in end cover bushing or roller bearing (44, 44A). If fit is obviously too loose, replace as follows:

BUSHING REMOVAL

Clamp 9/16 in. - 24 plug tap in vise and turn end cover onto tap by hand until bushing is removed. Assemble generator parts 7, 6, 9, 10, 28 and 33. Place new bushing on end of arm in special Harley-Davidson Generator Bushing Tool, Part No. 97250-58, and insert arbor through generator from drive gear end. Place pilot tool over arbor and seat in bearing recess in generator drive end plate. Drive bushing into end cover until it seats firmly. Remove arbor by twisting. Insert screwdriver or rod in hole in arbor to assist in twisting if necessary. Disassemble generator parts.

ROLLER BEARING REMOVAL

Press out worn bearing. Support end cover and press on closed end of new bearing until it is flush with surface of end cover.

ASSEMBLING GENERATOR (Fig. 5E-1)

Assemble all parts to the brush holder mounting plate (13).

Position pole shoes (31) in field coils (32) and insert in frame. Turn in pole shoe screws until snug. Place frame in vise and use very large
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Screwdriver to securely tighten screws. Use a wrench to turn screwdriver while bearing down with considerable force to keep screwdriver from slipping out of slots. Shoes will align themselves in frame.

Place bearing retainer (27) in inner groove in drive end plate (28). Press in bearing (26) to seat against retainer. Compress bearing retainer (25) with needle nose pliers and insert in outer groove.

Turn drive end plate back side up and press oil seal (29) in place. Insert armature (14) drive end shaft and press in until shoulder seats.

Slip "A" terminal field coil lead on positive terminal screw (24), followed by positive brush cable (23), a terminal screw bushing (20), bolt clip (19) and the terminal insulator (18). Insert the assembly through "A" terminal frame hole from inside. Assemble the insulating washer (17), lock washer (16) and nut (15) over terminal screw.

Slip "F" terminal screw (22) into "F" terminal field coil lead, bracket insulator (21) and screw bushing (20). The assembly is then slipped into "F" terminal frame hole through the bolt clip and terminal insulator. An insulating washer (17), lock washer (16) and nut (15) are assembled over terminal screw.

Slip frame assembly over armature, locating pin (48) in hole in drive end plate. Bend loose end of positive brush cable out commutator end of generator. Push brushes back in brush holders to clear commutator and assemble brush holder mounting plate over commutator so pin (48) registers in small slot and brush cable passes through large slot almost directly opposite.

Connect positive brush cable and positive brush lead to insulated brush holder terminal with washer (12) and nut (11). Connect grounded (negative) brush to its terminal in same manner.

Install commutator end cover (10) over armature shaft end so notch in edge registers over pin (48) in frame. Slip internal lock washers over frame screws (9) and feed them through generator from drive end. Assemble lock washers (8) and nuts (7) to frame screws and tighten securely. Turn armature shaft to see if it is bound or if armature core strikes pole shoes. Shaft should be reasonably difficult to turn but there should be no tight spots. If armature core strikes pole shoes, generator ends are not seated properly or pole shoes are not drawn up tightly.

Slip drive end oil deflector (5), drive gear (4 or 4A) and washer (3) over shaft and turn on nut (2) until gear is seated against oil deflector. Install brush cover strap (6) with connection at bottom as positioned on motorcycle. Position gasket (1) coated with Perfect Seal No. 4 to generator and install in reverse order of disassembly as described in "Removing Generator."

SECTION 5E

Electrical - Generator

FAN COOLED GENERATOR

The fan cooled generator is essentially the same as the standard, electrically, that is, it is a two-brush, shunt wound generator. Charge rate is governed by a current and voltage regulator. The difference is a larger physical size with higher current generating capacity, and it employs a fan to dissipate heat. Much of the technique used in testing the standard generator may be used in testing the fan cooled generator.

CHECKING GENERATOR

Before checking a generator believed to be faulty, check generator signal light as described in "Checking Generator", standard generator.

If generator signal light circuit is not shorted proceed as follows:

Disconnect any condensers found connected to gener-ator "A" terminal. A shorted condenser will prevent generator from charging.

See Fig. 5E-7. Remove the three screws (1) and washers (2) securing the fan housing (3) and remove it. Inspect brushes to make sure they are not worn out, broken or gummy and sticking in holders.

TESTING GENERATOR OUTPUT

Test generator output as described in "Testing Generator Output," standard generator. Generator should generate 20 amperes or more. If it does not, trouble is in one or more of components listed.

REMOVING GENERATOR

DUO-GLIDE. Disconnect wires from generator "F" and "A" terminals. Remove two long screws through timing gearcase cover securing generator. Remove footshifter assembly and jiffy stand (footshift model) or clutch assembly and jiffy stand (handshift model). Remove generator to left side of chassis.

SERVI-CAR. Disconnect wires from generator "F" and "A" terminals. Remove two long screws through timing gearcase cover securing generator and remove generator to left side of chassis, depressing clutch pedal to allow generator to pass.

TESTING FIELD COILS

The field coils of the model fan cooled generator are not spliced together so there are four leads rather than two.

Testing procedures are the same as described in "Testing Field Coils" on the standard generator except for following differences:

After step one remove parts number 4 through 19. (See "Disassembling Fan Cooled Generator"). Assemble terminal components eliminating field coil leads.
### LEGEND FOR FIGURE 5E-7

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fan housing screw (3)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Internal lock washer (3)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Fan housing</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Armature shaft nut</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Armature shaft lock washer</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Armature shaft plain washer</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Fan</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Armature shaft key</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fan baffle plate screw (3)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Fan baffle plate</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Fan spacer</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Fan housing spider</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>End plate</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Brush end bearing housing</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Drive end cover gasket</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Inner oil retainer</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Commutator end bearing shim (0 to 3)</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Terminal screw (3)</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Brush and spring (2)</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Clutch spring collar pin</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Clutch spring collar</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Oil slinger</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Clutch spring</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Drive gear</td>
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</tr>
<tr>
<td>25</td>
<td>Clutch</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Drive end oil deflector</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Frame screw (2)</td>
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</tr>
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<td>28</td>
<td>Frame end</td>
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</tr>
<tr>
<td>29</td>
<td>Armature bearing</td>
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<td>30</td>
<td>Armature spacing shim (.020 in.)</td>
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<tr>
<td>31</td>
<td>Bearing plate spring ring</td>
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<td>32</td>
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<td>Armature bearing</td>
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<td>Drive end spring ring</td>
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<tr>
<td>35</td>
<td>Felt retainer</td>
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</tr>
<tr>
<td>36</td>
<td>Negative brush holder screw (2)</td>
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<tr>
<td>37</td>
<td>Lock washer (2)</td>
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<tr>
<td>38</td>
<td>Brush holder screw nut (2)</td>
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<td>39</td>
<td>Brush holder (negative)</td>
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<td>40</td>
<td>Terminal screw nut (2)</td>
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<tr>
<td>41</td>
<td>Terminal screw lock washer (2)</td>
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</tr>
<tr>
<td>42</td>
<td>Terminal screw insulating washer (2)</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Field coil terminal insulator (2)</td>
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<tr>
<td>44</td>
<td>Field coil terminal</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Terminal screw (2)</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Terminal screw bushing (2)</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Brush holder (positive)</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Brush holder insulation</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Pole shoe screw (4)</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Pole shoe (2)</td>
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</tr>
<tr>
<td>51</td>
<td>Field coil (2)</td>
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</tr>
<tr>
<td>52</td>
<td>Air intake shield screw (2)</td>
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<tr>
<td>53</td>
<td>Air intake shield (2)</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Spacing bushing (2)</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Generator frame</td>
<td></td>
</tr>
</tbody>
</table>

**SECTION 3E**

**Electrical - Generator**

In step three, touch one test lead to generator frame, the other to either of two field coil leads, making sure other lead from same coil does not touch generator frame. Repeat process on other coil.

Omit step four.

In place of step five, touch ammeter leads to two field coil leads. Repeat process with opposite coil. Ammeter should read 1 ampere in both cases. No reading indicates an open coil, a higher reading indicates a shorted coil.

In step six, touch one test lead to generator frame, the other to positive (insulated) brush holder.

### TESTING ARMATURE

Test armature as described in "Testing Armature," standard generator.

### REPAIRING COMMUTATOR

Repair commutator as described in "Repairing Commutator," standard generator.

### POLARIZING GENERATOR

Polarize generator as described in "Polarizing Generator," standard generator.

### GENERATOR CHARGING RATE

Refer to directions in "Generator Charging Rate," standard generator, except minimum charging rate should be 20 amperes.

### DISASSEMBLING GENERATOR (Fig. 5E-7)

Remove three fan housing screws (1), washers (2) and fan housing (3). Turn off armature shaft nut (4) and remove lock washer (5) and plain washer (6).

Use All Purpose Claw Puller, Part No. 95635-46, to pull the fan (7). Remove key (8) (if used) from armature shaft.

Remove three fan baffle plate screws (9) and lift off baffle plate (10), fan spacer (11), fan housing spider (12) and end plate (13). Use Claw Puller to pull brush end bearing housing (14). Ball bearing (29) should come off with bearing housing and parts 30 and 31. However, the bearing sometimes stays on the shaft holding parts 15, 16, and 17, in place. In that event, do not remove bearing and go on to following procedure.

Remove terminal screws (18) and lift brush and spring assemblies (19) out of brush holders. At this point electrical checks to determine condition of field coils may be made (see "Testing Field Coils").

Drive clutch spring collar pin (20) out of clutch spring collar (21) on Duo-Glide, out of oil slinger (22) on Servi-Car. Slip clutch spring (23) and drive gear off armature shaft. Pull clutch (25) from shaft using All Purpose Claw Puller. Lift oil deflector (26) off shaft.

Loosen frame screws (27) about 1/4 in. and tap on ends to unseat frame end (28). Remove frame screws and pull frame end with bearing (29), gasket (15), oil retainer (16) and bearing shims (17) if there are any. In factory assembly, these shims are supplied as needed to center brushes on commutator. The usual assembly includes up to three spacing shims.

The armature (32) may be pressed out of the frame to release drive end ball bearing (33). If necessary spring ring (34) and felt grease retainer (35) can be removed.
SECTION 5E
Electrical - Generator

There is no need to disassemble brush holders (39 and 47) from frame end unless test proves the positive holder is shorted, or unless they are badly bent or broken. If removal is necessary, turn out negative brush holder screws (36) and terminal screw nuts (40) to free all parts.

Do not remove pole shoe screws unless necessary to replace pole shoes or field coils. If necessary, turn out pole shoe screws (49) several turns, then tap on heads to loosen pole shoes (50) from keyed slots in frame before turning screws completely out.

Air intake shields (53) may be removed at any time convenient during the disassembly procedure.

CLEANING, INSPECTION AND REPAIR

Clean all parts except gaskets, felt grease retainer, armature field coils and brushes in cleaning solvent and blow dry with compressed air. Wipe armature, field coil and brushes clean with cloth dampened in white gas and blow dry with compressed air.

Examine all parts carefully for wear. Give close attention to condition of insulators, armature windings, field coil wrapping and surfaces of pole shoes nearest armature.

If play can be detected in ball bearings, replace them. Pack bearings, liberally with "Grease-All" grease before assembly of parts.

ASSEMBLING GENERATOR

Assemble generator in approximate order of disassembly. Install field coils in frame. Insert armature and assemble the felt retainer, spring ring and bearing. Use arbor press to push bearing in place.

Assemble brush holders to frame end and slip frame end in place over frame. If frame end is a tight fit, it may be drawn into place by tightening frame screws. Bring field coil leads (1, 2 and 3 Fig. 5E-7A) through smaller opening in frame end and lead 4 through larger opening. Select lead ends 1 and 3. Run lead 1 behind field coil terminal, make loop and place it over field coil terminal. Twist leads 2 and 3 as in first half of shoe tying operation and secure to field terminal with terminal screw (16, Fig. 5E-7). Twist leads 2 and 4 in similar manner and attach to positive brush terminal with brush in place. Be sure lead 3 is behind frame screw. Assemble negative brush.

Assemble commutator end of generator in reverse of order disassembled, replacing same number of shims (17, Fig. 5E-7) that were removed.

Install generator in reverse order of removal as described in "Removing Generator," standard generator. Test generator as described in "Testing Generator Output," standard generator.
The ignition system has two circuits, the primary circuit and the secondary circuit. The primary circuit consists of the battery, switch, primary coil, breaker points, condenser and associated wiring. The secondary circuit consists of the secondary coil, the spark plugs and associated wiring.

The circuit breaker has two functions. First, the breaker cam and contact points open and close the low tension circuit between the battery and ignition coil causing the coil to produce high voltage discharge to the spark plugs. Second, the circuit breaker times discharge for proper engine firing.

The following three types of circuit breakers are in use:

**SINGLE CONTACT POINT CIRCUIT BREAKER WITH MANUAL ADVANCE (Fig. 5F-1).**

The breaker points are operated by a cam with a narrow and wide lobe. The narrow lobe times the front cylinder and the wide lobe times the rear cylinder. A single ignition coil fires both spark plugs at the same time, but one spark occurs in the exhaust stroke of one cylinder and the other spark fires the combustible gases in the other cylinder to produce the power stroke. Timing is advanced or retarded by manual rotation of circuit breaker base in relation to cam.

**SINGLE CONTACT POINT CIRCUIT BREAKER WITH AUTOMATIC ADVANCE (Fig. 5F-1A).**

Automatic advance circuit breaker functions the same way as the manual advance circuit breaker except that the spark timing cam is advanced automatically as engine speed increases through action of the flyweights in the circuit breaker base. This insures correct spark timing to suit both starting and running requirements.

**DOUBLE CONTACT POINT CIRCUIT BREAKER (Fig. 5F-1B).**

Ignition spark is produced by operation of separate circuit breaker contact points and ignition coils for each spark plug. The breaking of each set of breaker points by a single-lobe cam on the timer shaft determines the spark timing. The single-lobe cam opens the breaker points, individually firing alternate cylinders every crankshaft revolution.

![Diagram](image-url)
TROUBLE SHOOTING

Disengage spark plug cable and insert a metal rod, screw or nail into each spark plug cable. Arrange cable end so tip of inserted metal object is 1/4" away from cylinder head. Turn on the ignition, break the points by hand. See if a 'hot' or 'blue' spark is obtained. If not, it is an indication of a weak coil, dead battery, broken or loose wires, etc. Arcing of the points and hard starting indicates a faulty condenser.

ADJUSTING CIRCUIT BREAKER POINTS

NOTE

Refer to either Fig. 5F-1, 5F-1A or 5F-1B corresponding to circuit breaker used.

Circuit breaker point contacts should be checked for gap and surface condition initially at 500 and 1,000 miles, and every 2,000 miles thereafter. Point contacts that have undergone considerable use, may not appear bright and smooth. However, this should not be interpreted as meaning points are worn out. Circuit breaker points that are burned or pitted should be dressed or renewed as described in "Inspection and Replacement of Parts."

SINGLE CONTACT POINT CIRCUIT BREAKER.

Check the gap between the contact points with a feeler gage (wire preferred). Point gap should be exactly .020 in. when the lever fiber (2) is on the highest point of cam (1). Incorrect point gap spacing affects ignition timing. To adjust the points, loosen lock screw (6) and move the eccentric adjusting screw (7) to provide correct contact point gap. Retighten lock screw (6) and again check the gap to be sure it remains correct.

DOUBLE CONTACT POINT CIRCUIT BREAKER.

On double circuit breaker (Fig 5F-1B) adjust front cylinder contact points (5) (marked "F" on base) to .022 in. gap according to above procedure. Then adjust rear cylinder contact points (5A) to .022 in. gap in similar manner.

IMPORTANT: Check ignition timing whenever double circuit breaker points are adjusted since any change in rear contact point gap affects ignition timing.

CHECKING AND ADJUSTING IGNITION TIMING

MANUAL ADVANCE CIRCUIT BREAKERS

NOTE

Refer to either Fig. 5F-1 or 5F-1B corresponding to single or double circuit breaker.

Remove spark plugs to permit engine to turn easily. Remove screw plug from timing inspection hole in left side of crankcase. Telescope front push rod cover so that opening and closing of valve can be ob-
served. Remove circuit breaker cover and set circuit breaker point gap as described in "Adjusting Circuit Breaker Points."

Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closes), and continue turning engine very slowly (less than 1/2 revolution) until timing mark for front cylinder on flywheel is aligned in inspection hole, as shown in Fig. 5F-3. Make sure timing mark (8) on circuit breaker base aligns with end of timing adjusting plate (10).

Rotate circuit breaker head counterclockwise against stop (fully advanced position).

Timing mark (3) on cam lobe should now align with circuit breaker arm fiber cam follower (2). If it does not, but is only slightly out of alignment, loosen timing adjusting stud lock nut (9) and shift circuit breaker head to attain alignment. Timing mark (8) will no longer line up exactly with edge of plate (10). Be sure to securely retighten lock nut. Remember that circuit breaker must be fully advanced when checking alignment of timing mark with fiber cam follower.

1. SINGLE CONTACT POINT CIRCUIT BREAKER,

Use a test lamp to determine when point contacts open as follows: Connect one test lamp wire to coil wire (12, Fig. 5F-2) at spark coil terminal. Connect the other test lamp wire to the battery positive terminal. Ground battery negative terminal to engine. With points closed, lamp will light, and points open, lamp will be out.

With circuit breaker fully advanced against its stop and flywheel mark correctly positioned as shown in Fig. 5F-3, contact points should just begin to open, "light off." The instant direction is reversed (spark retarded) from full advance stop position, points should begin to close, "light on."

If the contact points remain closed, "light on", in the fully advanced position, timing is late. Loosen adjusting stud lock nut (9, Fig. 5F-1) and shift circuit breaker base counterclockwise until contact points just begin to open (timing light just flickers or goes off) in fully advanced position.

If the contact points begin to open, "light off", before circuit breaker is in fully advanced position, timing is early. Loosen adjusting stud lock nut (9, Fig. 5F-1) and shift circuit breaker base clockwise until contact points just begin to open, "light off", in fully advanced position.

Retighten lock nut (9) then move circuit breaker from retard to advance to see that points will just open when the circuit breaker reaches the advance stop. Be sure to keep flywheel mark correctly positioned during the entire procedure.

NOTE: Timing ignition for front cylinder automatically times ignition for rear cylinder.

CHECKING TIMING. Install circuit breaker cover (1, Fig. 5F-2), turn engine in direction in which it runs until front piston is on compression stroke. Continue to turn engine very slowly until points just begin to open, "light off." Flywheel mark should be correctly located in inspection hole as shown in Fig. 5F-3.

If timing mark is forward of correct position as shown in Fig. 5F-3, timing is late. If timing mark is to the rear of correct position as shown in Fig. 5F-3, timing is early. In either case, re-adjust timing as previously described.

2. DOUBLE CONTACT POINT CIRCUIT BREAKER

TIMING FRONT CYLINDER. Connect one test lamp wire to circuit breaker yellow wire (12A, Fig. 5F-2) (front spark coil terminal), and the other wire to the battery positive terminal. Ground battery negative terminal to engine. Time front cylinder breaker points (marked "F" on circuit breaker base) with flywheel timing mark for front cylinder aligned in inspection hole as shown in Fig. 5F-3. Same as for single contact point manual advance circuit breaker.

Figure 5F-3. Ignition Timing - Schematic - Manual Advance Circuit Breaker

TIMING REAR CYLINDER. Connect one test lamp wire to circuit breaker black wire (12A, Fig. 5F-2) (rear spark coil terminal) and the other wire to the battery positive terminal. Ground battery negative terminal to engine. Fully advance circuit breaker.

Turn engine flywheel shaft in direction in which it runs until the mark on the cam approaches the cam follower fiber on the rear cylinder breaker points.

Continue rotating engine very carefully in same direction until timing mark for rear cylinder (marked "R" on flywheel) is aligned in inspection hole as shown in Fig. 5F-3.
Figure 5F-2. Circuit Breakers - Exploded View

10, 10A, 10B. Base nut and washer
11. Stud nuts and washers
12, 12A. Cable
13. Wire stud fiber washer
14. Wire stud
15. Wire stud insulator
16. Adjusting stud lock nut
17. Adjusting stud
18. Adjusting stud plate
19. Control wire lock screw
20. Base retainer
21, 21A. Crankcase screw (2)
22, 22A, 22B, 22C. Stem
23, 23A, 23B. Gasket or O-ring
24. Cam
25. Clip (2)
26. Flyweight (2)
27. Flyweight spring (2)
28. Washer (4)
29, 29A, 29B, 29C. Camshaft
30. Gear pin
31. Gear
32. Shaft washer
33. Eccentric screw
34, 34A. Stem clamp
35. Clamp nut or bolts

Revised: 10-65
NOTE: Flywheel is not marked for rear cylinder timing on 1961 Duo-Glide engines made prior to Engine No. 61FLH 7987 and piston position must be used as an alternative to flywheel timing marks as follows:

Piston position can be determined by using spark timing gage Part No. 95885-61 which screws into spark plug hole. Gage rod contacts piston top to indicate piston position. Gage rod has two marks. When engine is turned over so gage rod has moved to highest point (piston at top dead center) set gage collar exactly at lower mark on gage rod. Piston position before top center is indicated when engine is turned over and piston moves so rod upper mark comes even with gage collar. If timing gage is not available, rear cylinder head can be removed and piston position measured with a scale or dial indicator.

With circuit breaker fully advanced against its stop and flywheel timing mark for rear cylinder correctly positioned as shown in Fig. 5F-3, contact points should just begin to open, "light off." The instant direction is reversed (spark retarded from full advance position), points should begin to close, "light on."

If contact points remain closed "light on" in the fully advanced position, timing is late - point contacts set too close together.

If contact points begin to open "light off" before circuit breaker is in fully advanced position, timing is early - point contacts set too far apart.

To correct rear cylinder timing, the breaker points must be readjusted so contact points just begin to open (timing light just flickers or goes off) when circuit breaker is fully advanced.

NOTE: This will result in a different point contact opening than original setting of .022 in.

Check the rear cylinder timing with timer cover installed, using same procedure as given in preceding paragraph heading, "Checking Timing," but using rear cylinder breaker points and rear cylinder flywheel timing mark.

NOTE: If engine is in chassis, test lamp can be connected to circuit breaker wire and engine (ground). With ignition turned on, lamp will light with points open and go off with points closed, exactly opposite from battery hookup previously described.

CHECKING AND ADJUSTING IGNITION TIMING AUTOMATIC ADVANCE CIRCUIT BREAKER

NOTE
Refer to Fig. 5F-1A - Automatic Advance Circuit Breaker.

Follow same procedures as for manual advance circuit breaker, aligning advance timing mark (Fig. 5F-3A) in center of inspection hole according to model being worked on as shown. 

Timing mark (3) on top edge of circuit breaker cam (1) should align perfectly with breaker arm fiber cam follower (2). If it does not, shift circuit breaker head to attain alignment as follows:

1966 and later models have clamp (16) on circuit breaker stem to allow 360° adjustment range.

Loosen clamp nut or bolts (15) and shift circuit breaker head (19) clockwise (retard) or counterclockwise (advance) to attain alignment. 1965 models have slotted holes in timer plate for base studs to allow limited adjustment. Loosen circuit breaker head nuts (9) and shift base on stem to attain alignment. Timing marks (8) will no longer exactly line up. Retighten nuts (9) securely, but care must be taken not to overtighten or breaker head base plate will distort and affect timing.

Circuit breaker cam must be fully advanced clockwise against stop when checking alignment of mark (3) with fiber cam follower (2).

Figure 5F-3A. Ignition Timing Schematic, Automatic Advance Circuit Breaker
SECTION 5F
Electrical - Circuit Breaker

NOTE
Cam (1) engages flyweights on cam shaft in either of two positions 180° apart, but only one of these positions will give correct ignition timing. If cam (1) is removed for any reason and engagement with flyweight is lost, see subsequent paragraph, "Installing Circuit Breaker."

Use a test lamp to determine when contact points open (Fig. 5F-1) and follow the same procedure as for the MANUAL ADVANCE SINGLE CONTACT POINT CIRCUIT BREAKER and adjust circuit breaker head by shifting as necessary to obtain approximate timing.

NOTE
The above timing will be approximate (slightly retarded) because of circuit breaker drive gear lash and endplay which exist when engine is not operating. To set ignition timing accurately, it must be checked with a strobe light timing gun with the engine running according to the procedure in the following paragraphs.

CHECKING TIMING WITH STROBE LIGHT
With engine running cam will automatically be in advanced position above idle speed. To check advanced spark timing operate engine between 1500 and 2000 RPM using Strobe-light timing light to view timing mark. Timing light leads should be connected to front spark plug, ground, and positive red wire to battery terminal. A clear plastic timing hole plug is available for screwing into the crankcase hole for viewing the flywheel timing mark to prevent oil spray while the engine is running. Order Timing Mark View Plug, Part No. 96295-65. Adjustment in timing is made with engine running by loosening circuit breaker stem clamp or head nuts slightly and rotate head into correct position. See Figure 5F-3B.

REMOVING CIRCUIT BREAKER (Fig. 5F-2)
Thoroughly clean area around circuit breaker and blow all loose dirt from crankcase with compressed air, and proceed as follows: On manual advance types, disconnect spark control wire from circuit breaker adjusting stud (17). Remove circuit breaker cover (1) and unlash cover retainer (2) from holes in base (10 or 10A). On automatic advance type, remove screw and lockwasher (2A) to remove circuit breaker cover (1B).

DUO-GLIDE MODEL
Remove the front cylinder head from the engine on models prior to 1962 to provide sufficient clearance for removal of circuit breaker assembly. See Duo-Glide Cylinder Head, Section 3B. Using circuit breaker wrench, Part 94501-56, remove two screws (21A). Shaft and housing assembly can be lifted from gear case. On manual advance types, slip base (10 or 10A) and retainer (20) from housing. On 1965 automatic advance type, remove nuts and washers (20A) then slip base (10B) from housing. On 1966 automatic advance type, remove stem clamp nut (35) and clamp (34) to free entire circuit breaker from crankcase.

DUO-GLIDE - SPORTSTER

SERVI-CAR

1964 AND EARLIER SPORTSTER AND 1963 AND EARLIER SERVI-CAR MODELS
Remove base (10) and retainer (20) exposing two screws (21) securing shaft and housing assembly to gear case cover. Remove screws (21) and lift shaft and housing from gear case cover. On 1966 automatic advance type, remove stem clamp bolts (35) and clamp (34A) to free entire circuit breaker from crankcase.

INSPECTION AND REPLACEMENT OF PARTS (Fig. 5F-1, 5F-1A, 5F-1B and 5F-2)
Using cloth with clean white gasoline, wipe circuit breaker clean and inspect parts.
Inspect circuit breaker contact points (5 and 5A). If lever fiber (2) is badly worn, replace points. Points that are burned or pitted should be replaced or dressed with a clean, fine-cut contact point file. Do not attempt to remove all roughness nor dress point surfaces down smooth; merely remove scale or dirt. Contact point file should not be used on other metal and should not be allowed to become greasy or dirty. Never use emery cloth or sandpaper to clean points, since particles will embed themselves and cause arcing and rapid burning of points.
Circuit breaker points should be replaced, if contact point pressure is not within prescribed limits of 14 to 16 oz. Check pressure with a spring gauge. The scale should be hooked to the breaker lever at an angle of 90 degrees with the point surface and reading taken just as points break. Excessive pressure causes rapid wear of fiber block, cam, and contact point. Insufficient pressure will permit high speed point bounce which will, in turn, cause arcing and burning of the points and missing of the engine.
Point faces must seat squarely against each other. If bent, square up by bending contact plate.
To replace a set of circuit breaker points, loosen screw (11L) and slip condenser wire and connection from screw. Lift circuit breaker lever (12) from

Figure 5F-3B. Checking Timing with Strobe-Lite

1965 AND LATER SPORTSTER AND 1964 AND LATER SERVI-CAR
On earlier models, remove nuts and washer (20A) which secure base to stem. Remove base (10B) exposing two screws and washers (21) securing shaft and housing assembly to gear case cover. Remove screws (21) and lift shaft and housing from gear case cover. On 1966 automatic advance type, remove stem clamp bolts (35) and clamp (34A) to free entire circuit breaker from crankcase.

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screw (11) and pivot stud (13). Remove screw (6) and circuit breaker contact point and support (14). Install new points in reverse order of disassembly. Position circuit breaker lever (12), lever notch registered with screw (11), between brass washer and condenser wire end. Be sure point faces seat squarely against each other. Adjust point gap as previously described in "Adjusting Circuit Breaker Points."

Lubricate breaker cam with a trace of grease when points are replaced or every 5000 miles. Also remove cam and lubricate shaft with very light grease Delco Remy No. 1960954 or equivalent. Replace cam in correct position.

Check circuit breaker advance flyweight action by moving cam in direction required to advance weights to their fully extended position. Then release the cam and see if springs return to the fully retarded position. Correct causes for faulty action by cleaning and lubricating shaft, cam and flyweights and replacing weak springs.

Be extremely careful to avoid excessive lubrication. If too much grease is used, the excess is apt to get on the contact points and cause them to burn.

For maximum operating efficiency it is recommended practice to replace circuit breaker points when pitted, burned or worn excessively.

The condenser (4) is a relatively long life part and will not require frequent replacement. However, if the condenser is suspected of being defective simply replace with a proven new condenser and note whether engine performance is improved. A condenser that is defective will have either an open or short circuit. An open circuit will be evident by excessive arcing at breaker contact points and a shorted circuit will have no noticeable spark at the contact points.

Examine the circuit breaker base pivot stud (13) for wear or damaged condition. Try circuit breaker base (10, 10A or 10B) Fig. 5F-2 on stem, (22, 22A, 22B or 22C) for free turning, but not loose fit. If base has too much clearance on stem, the circuit breaker point gap will vary as the base is shifted for spark control. If base is found excessively worn or damaged in any way, renew it.

Examine the coil to circuit breaker low tension wire (11 or 12A, Fig. 5F-2) for brittles or cracked insulation and broken strands and replace if defective. Inspect circuit breaker wire stud insulator (13) and fiber washer (15) for brittle or cracked condition. Unless inspection shows insulation defective, it is not necessary to remove stud, insulator and washers.

Examine cam advance mechanism on automatic advance circuit breakers to see that flyweights (26) move outward freely and springs (27) return them inward against stops. Check for looseness of cam (24) on splindep (26B or 26C) and wear on sides of flyweight (26) ears which engage slots in cam. Check springs (27) and replace if stretched or distorted.

To disassemble mechanism pry clips (28) from grooves in pivot pins on stem plate (26B or 26C). Inspect teeth or worm gear (31) for excessive wear and damage. Check the amount of end play and side play of shaft (26, 26A, 26B or 26C) in stem. End play in excess of .006 in.; or excessive side play of shaft in stem bushings will affect ignition timing and also allow oil from cam gear base to enter breaker assembly base to contaminate ignition points.

If renewal of shaft or stem parts is necessary remove pin (30) from gear and lift or press circuit breaker cam shaft from gear. Withdraw cam shaft from base. If bushings have excessive wear, timer stem assembly can be replaced or stem assembly can be rebuilt by drilling out old bushings and installing new bushings. New bushings should require no reaming. When reassembling gear and breaker cam shaft use spacer washer (.062 thick), (.066 thick), (.072 thick) or (.076 thick) to obtain a .001 to .007 in. shaft end play.

When assembling breaker shaft in breaker stem, always secure gear and spacer washer to shaft with new steel pin riveted in place. Rotate shaft to be sure it is free in stem.

INSTALLING CIRCUIT BREAKER

INSTALLING CIRCUIT BREAKER 1964 AND EARLIER DUO-GLIDE MANUAL CIRCUIT BREAKERS

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in left side of crankcase. Telescopic front push rod cover so that opening and closing of valve can be observed. Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closes) and continue turning engine very slowly (less than 1/2 revolution) until advance timing mark on flywheel is aligned in inspection hole as shown in Fig. 5F-3.

Assemble circuit breaker as follows (See Fig. 5F-2):

Position circuit breaker base assembly (10 or 10A) on shaft and stem assembly (22 or 22A), wrapping wire (12 or 12A) clockwise around shaft. Install base retainer (20) over wire, retainer ends facing down and toward front cylinder. Engage cover retainer (1) with holes in base and register retainer ends in locating notches of base retainer (20).

Make sure timing mark (8, Fig. 5F-1 or 5F-1E) on circuit breaker base aligns with end of adjusting stud plate (10).

Install a new circuit breaker gasket (23 or 23A, Fig. 5F-2) using gasket sealer. Turn circuit breaker shaft counterclockwise approximately 60 degrees from position where mark on cam lobe lines up with breaker lever fiber.

Temporarily insert circuit breaker assembly into gear case, with adjusting stud pointing toward the front of motorcycle and screw holes of stem housing lined up with mounting holes in crankcase. Move circuit
SECTION 5F
Electrical - Circuit Breaker

breaker base (10 or 10A) to fully advanced position (counterclockwise) and observe how close timing mark on cam lobe lines up with breaker lever fiber.

NOTE
On double contact breakers, mark on cam lobe must align with breaker lever fiber on contact points for front cylinder. This set of contact points is identified on breaker base by (D).

If fiber does not line up with cam lobe timing mark, lift circuit breaker assembly and turn shaft gear so engagement of driving gear is changed one tooth. Again check cam lobe timing mark for alignment with lever fiber. Repeat this procedure until gear engagement is attained which closely aligns cam lobe mark and lever fiber, then secure circuit breaker assembly to crankcase.

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.

1965 ELECTRA-GLIDE AUTOMATIC ADVANCE CIRCUIT BREAKER

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in left side of crankcase. Telescope front push rod cover so that opening and closing of valve can be observed. Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closed) and continue turning engine very slowly (less than 1/2 revolution) until timing mark (Fig. 5F-3A) on flywheel is aligned in the inspection hole.

Assemble circuit breaker as follows: (See Fig. 5F-2). Lubricate camshaft end of shaft and stem assembly (22C) and install breaker cam (24) on camshaft so that notches in cam engage with flyweights (26). Place breaker base (10B) on stem and shaft assembly. Put on nuts and washers (20A) but do not tighten.

Screw mounting stud slots in breaker base are offset, and base can be installed only in one position to allow full range of circuit breaker adjustment. Be sure to align timing marks (8, Fig. 5F-1A) on Stem and breaker base.

Install a new circuit breaker rubber seal (23B). Turn circuit breaker shaft counterclockwise approximately 60 degrees from position where mark on cam lobe lines up with breaker lever fiber. Temporarily insert stem (23C) into crankcase with timing marks (6, Fig. 5F-1A) toward outside of engine with screw holes in stem housing aligned with screw holes in crankcase. With flywheel retarded ignition timing mark in center of timing hole in crankcase, observe how close timing marks on cam lobe lines up with breaker lever fiber.

If fiber does not line up with cam lobe timing mark, lift circuit breaker assembly and turn shaft gear so engagement with driving gear is changed one tooth. Again check cam lobe timing mark for alignment with lever fiber. Repeat this procedure until gear engagement is attained which closely aligns cam lobe mark and lever fiber, then secure circuit breaker assembly to crankcase.

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.

1964 & LATER SERVI-CAR AND 1965 SPORTSTER AUTOMATIC CIRCUIT BREAKERS

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in

end with retainer notch is to insert cover retainer (2) under flats of base retainer (20). Then, with a screwdriver, move base retainer (20) until its notches register with ends of retainer (2).

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.

1965 ELECTRA-GLIDE AUTOMATIC ADVANCE CIRCUIT BREAKER

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in left side of crankcase. Telescope front push rod cover so that opening and closing of valve can be observed. Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closed) and continue turning engine very slowly (less than 1/2 revolution) until timing mark (Fig. 5F-3A) on flywheel is aligned in the inspection hole.

Assemble circuit breaker as follows: (See Fig. 5F-2). Lubricate camshaft end of shaft and stem assembly (22C) and install breaker cam (24) on camshaft so that notches in cam engage with flyweights (26). Place breaker base (10B) on stem and shaft assembly. Put on nuts and washers (20A) but do not tighten.

Screw mounting stud slots in breaker base are offset, and base can be installed only in one position to allow full range of circuit breaker adjustment. Be sure to align timing marks (8, Fig. 5F-1A) on Stem and breaker base.

Install a new circuit breaker rubber seal (23B). Turn circuit breaker shaft counterclockwise approximately 60 degrees from position where mark on cam lobe lines up with breaker lever fiber. Temporarily insert stem (23C) into crankcase with timing marks (6, Fig. 5F-1A) toward outside of engine with screw holes in stem housing aligned with screw holes in crankcase. With flywheel retarded ignition timing mark in center of timing hole in crankcase, observe how close timing marks on cam lobe lines up with breaker lever fiber.

If fiber does not line up with cam lobe timing mark, lift circuit breaker assembly and turn shaft gear so engagement with driving gear is changed one tooth. Again check cam lobe timing mark for alignment with lever fiber. Repeat this procedure until gear engagement is attained which closely aligns cam lobe mark and lever fiber, then secure circuit breaker assembly to crankcase.

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.

1965 ELECTRA-GLIDE AUTOMATIC ADVANCE CIRCUIT BREAKER

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in
left side of crankcase. Telescope front push rod cover so that opening and closing of valve can be observed. Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closes) and continue turning engine very slowly (less than 1/2 revolution) until timing mark (Fig. 5F-3A) on flywheel is aligned in the inspection hole.

Assemble circuit breaker as follows (see Fig. 5F-2): On automatic advance circuit breakers, lubricate camshaft end of shaft and stem assembly (22B) and install breaker cam (24) on camshaft so that notches in cam engage with flyweights (26). Place breaker base (10B) on shaft and stem assembly. Put on nuts and washers (20A) but do not tighten. Stem mounting stud slots in breaker base are offset and base can be installed only in one position to allow full range of circuit breaker adjustment. Be sure to align timing marks (6, Fig. 5F-1A) on stem and breaker base.

Install a new circuit breaker gasket (23) using gasket sealer. Insert circuit breaker shaft and stem assembly into gear case cover with wire (12, Fig. 5F-2) inserted in hole of stem flange. On automatic advance circuit breakers, stem (22B) should be positioned so that timing marks on base (6, Fig. 5F-1A) face toward outside of engine. Before engaging circuit breaker driving gear, turn shaft counterclockwise, approximately 60 degrees from position where mark on cam lobe lines up with breaker lever fiber block. Insert screws (21, Fig. 5F-2) snug, but not tight. Temporarily position base on shaft and stem assembly with timing marks aligned.

With flywheel ignition timing mark in center of hole in crankcase, observe how closely mark on cam lobe lines up with lever fiber. If it does not line up, remove screws (21, Fig. 5F-2), lift circuit breaker shaft and stem assembly from gear case. Turn shaft gear so its engagement with its driving gear is changed one tooth. Check again according to breaker cam mark. Repeat this procedure until gear engagement is attained which closely aligns mark on cam with breaker lever fiber. Then tighten screws.

Position base assembly on shaft (29B) with timing marks on base (6, Fig. 5F-1A) in alignment and tighten hold down nuts and washers (20A, Fig. 5F-2) snugly, but do not overtighten.

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.

1966 AND LATER ELECTRA-GLIDE, SPORTSTER AND SERVİ-CAR AUTOMATIC ADVANCE CIRCUIT BREAKER

Remove spark plugs to permit engine to turn easily; remove screw plug from timing inspection hole in left side of crankcase. Telescope front push rod cover so that opening and closing of valve can be observed. Turn engine in direction in which it runs until front piston is on compression stroke (just after front intake valve closes) and continue turning engine very slowly (less than 1/2 revolution) until timing mark (Fig. 5F-3A) on flywheel is aligned in the inspection hole.

Assemble circuit breaker as follows: (See Fig. 5F-2). Lubricate camshaft end of shaft and stem assembly (22B) and install breaker cam (24) on camshaft so that notches in cam engage with flyweights (26). Place breaker base (10B) on stem and shaft assembly. Install nuts and washers (20A). Do not over-tighten. Install new seal (23B). Before installing circuit breaker, turn shaft gear to approximately align cam mark (3) with cam follower (2) as shown in Fig. 5F-1A. Insert circuit breaker into gearcase with wire toward rear of engine. This will position circuit breaker points to outside of engine permitting access to adjusting screws when cover is removed.

With flywheel ignition timing mark in center of timing hole in crankcase, observe how closely timing marks on cam lobe lines up with breaker lever fiber.

If fiber is not close to cam lobe timing mark, lift circuit breaker assembly and turn shaft gear in correct direction so engagement with driving gear is changed one tooth and reinstall circuit breaker in gearcase to get approximately close alignment of fiber and cam mark. Reinstall stem clamp (34 or 34A, Fig. 5F-2) and tighten clamp nut (or bolts) (35) being sure cam mark and fiber are still in alignment.

Adjust ignition timing. See previous paragraph "Checking and Adjusting Ignition Timing" in this section.
IGNITION COIL

DESCRIPTION

The ignition coil is a pulse transformer that transforms or steps up low battery or generator voltage to high voltage necessary to jump the electrode at the spark plug in the engine cylinder head. Internally, coil consists of primary and secondary windings with laminated iron core and sealed in waterproof insulating compound. Case cannot be taken apart or coil repaired.

TROUBLE SHOOTING  ALL MODELS

NOTE

Interpret references to "plug," "cable," "condenser" etc., as "plugs," "cables," "condensers" when more than one are used.

When hard starting or missing indicates a faulty ignition system, first, check condition of source of current (battery or magneto depending on model of motorcycle). If lamps light with full brilliancy and horn blows, indicating current source is in at least fair condition check, clean or replace spark plug. If this does not correct performance, inspect circuit breaker points and install new condenser. If condition persists, try a new ignition coil. (In the case where two separate coils are installed determine which is believed to be faulty.)

Temporarily substitute a new ignition coil by attaching it at any convenient point near old coil (coil will function without being securely grounded). Transfer terminal wires to new coil according to the information given in the wiring diagrams pertaining to the model being worked on. Attach new coil cable to the spark plug. If ignition trouble is eliminated by the temporary installation of new coil, carefully inspect old coil for damaged cables and insulation. The insulation on cables (and on some models the coil itself) may be cracked or otherwise damaged allowing high tension current to short to metal parts. This is most noticeable in wet weather or when motorcycle has been washed.

Replacing plug cable is the only repair that can be made to an ignition coil. If this does not correct faulty coil performance, coil is defective.

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Figure 5G-2. Ignition Coils - 1961 to 1964 Duo-Glide

1. Spark plug cable
2. Spark plug cable boot
3. Ignition coil
4. Positive terminal strip
5. Negative terminal
6. Positive terminal
SECTION 5G
Electrical - Ignition Coil

REPLACING SPARK PLUG CABLE
(Fig. 5G-2 and 5G-2B)

Remove old cable (1) from coil terminal and install new cable. Always be certain that cable boot or cap (2) is securely tightened to the coil tower to prevent moisture and dirt from contacting the high tension lead. Replace boot or cap if damaged or loose fitting.

(Fig. 5G-2A)

Warm coil slightly to soften sealing compound so old cables may be pulled out easily, without breakage. To warm coil allow current to flow through it by turning "ON" ignition switch (circuit breaker points must be closed). Have new cables ready with ends trimmed and rounded so they will follow the holes left in sealing compound. Clip off old cable at plug end and transfer cable packing nut, (4) cable washer (3) and new cable packing washer (2) onto the new cable and dip new cable end in very light oil. Remove old cable and quickly install new cable making certain it bottoms in the coil. After cable is installed turn seal nuts down against rubber packing washers to secure and seal it.

When replacing cables do not heat coil too hot, doing so will soften sealing compound to the extent that cable holes through compound will close up as old cables are pulled out, blocking the insertion of new cables. If this happens, allow coil to cool and then form new cable holes using a piece of tubing with saw teeth filed in one end. Tubing should be of slightly larger diameter than cable. Holes through compound must be open so cables can be inserted all the way to their seats, where they contact high tension winding terminals; otherwise there is a gap in the high tension circuit and coil will not function.

(Fig. 5G-2B)

Unscrew spark coil cap and pull spark cable from spark coil. Remove rubber seal, seal cover and cap from end of old cable and install on new cable with cap going on first, cover second and seal last. Place rubber seal far enough up on cable so that when installing new cable in spark coil, brass pin inside of coil will pierce cable. Slide cover on seal and secure assembly with cap.