AMERICAN BOSCH MARKETING DIVISION AMBAC INDUSTRIES INC SPRINGFIELD, MASS. 01107

Supersedes Manual Section 105-10-120, Issued June, 1967.

SERVICE INSTRUCTIONS
For
AMERICAN BOSCH
MAG-TRONIC IGNITION SYSTEM

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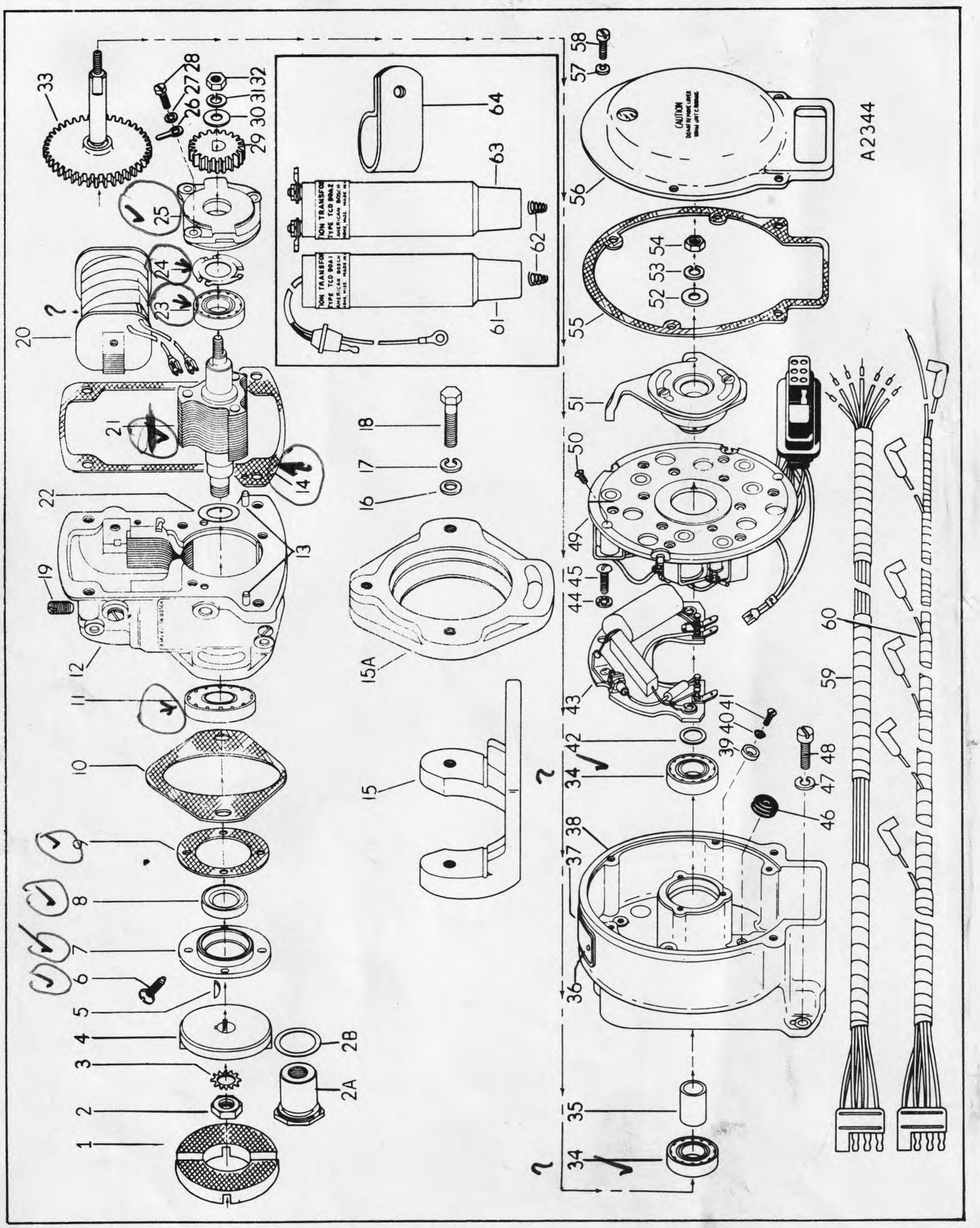

Figure 1-1 — MTC EXPLODED VIEW

AMERICAN BOSCH MARKETING DIVISION AMBAC INDUSTRIES INC. SPRINGFIELD, MASS. 01107

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GENERAL DESCRIPTION

The American Bosch MAG-TRONIC IGNITION SYSTEM is a self-contained, self-powered, low tension, low fire hazard, electronic system specifically designed to meet the ignition demand and reliability requirements of small to medium size, high speed, spark ignited engines.

The Mag-tronic Ignition System always includes an Ignition Generator (MTC---), a Wiring Harness (HAA---), and one Ignition Transformer TCD 90-----) for each spark plug.

The system may also include one or more SSA 101 Safety Switch Adapters and an SSA 202 Circuit Isolator.

The Ignition Generator is available for three inch horizontal flange, SAE vertical flange, 90° offset vertical flange and standard 45 MM base mounting, clock and counter-clockwise rotation.

An interpretation of the model number, or type designation, stamped into the Ignition Generator nameplate follows;

For numbered references in parenthesis, refer to Figure 1-1.

IGNITION GENERATOR

MTC 12 C 1 5 2 0 L

TYPE: MTC

CYLINDERS: 1, 2, 5, 6, 8, 10, 12 — 12

EDITION: C

MOUNTING: 1=45MM Base, 3=SAE Vertical Flange, 4=Horizontal Flange, 6=90° Offset Vert. Flange — 1

DRIVE GEAR RATIO: 2=2:1 (Eng. Speed), 3=3:1 (1-1/2 Eng. Speed), 5=2-1/2:1 (1-1/4 x Eng. Speed) — 5

ROTATION: Standard – 1=C'CLW, 2=CLW; Fungi-Proofed – 7=C'CLW, 8=CLW — 2

TIMER FIRING PATTERN – 2 CYCLE, – 4 CYCLE — 0

C = FACTORY SHIELDED UNITS
B = NON-STANDARD DRIVE PARTS
L = SLOW START — L

2-CYCLE ENGINES

	4-Cyl.	5-Cyl.	6-Cyl.	8-Cyl.	10-Cyl.	12-Cyl.
0 Even	90°	72°	60°	45°	36°	30°
1 Uneven	60°-120°		45°-75°	30°-60°	60°-12°	37.5°-22.5°
2 Uneven	63°-117°		90°-30°	22.5°-67.5°	63°-9°	40°-20°
3 Uneven			82.5°-37.5°		58.5°-13.5°	45°-15°
4 Uneven			63°-57°	36°-54°	66°-6°	22.5°-37.5°
5 Uneven			36°-84°	67.5°-27.5°		25°-35°
6 Uneven				60°-30°		15°-45°
7 Uneven				63°-27°		

- Cont'd -

4-CYCLE ENGINES

	4-Cyl	5-Cyl.	6-Cyl.	8-Cyl.	10-Cyl.	12-Cyl.
0 Even	180°	144°	120°	90°	72°	60°
1 Uneven	120°-240°		90°-150°	60°-120°	120°-24°	75°-45°
2 Uneven	126°-234°		180°-60°	45°-135°	126°-18°	80°-40°
3 Uneven			165°-75°		117°-27°	90°-30°
4 Uneven			126°-114°	72°-108°	132°-12°	45°-75°
5 Uneven			72°-168°	135°-45°		50°-70°
6 Uneven				120°-60°		30°-90°
7 Uneven				126°-54°		

1. DISASSEMBLY

NOTE

Before starting disassembly, test the Ignition Generator as indicated in paragraph 3.13 on Page 7. If a pulsating voltage reading is not obtained at each terminal, the distributor module is faulty.

1.1 Cover (56) and Gasket (55).

a. Remove the fastening screws and lockwashers, cover and gasket from the module housing. We recommend that the gasket be replaced at each overhaul.

1.2 Distributor Rotor Assembly (51).

a. Hold the rotor by hand and remove the fastening nut (54) with a 7/16" socket wrench.

b. Remove the rotor from the shaft by hand and wrap it in wax paper, or a suitable equivalent.

NOTE

If there is not a scribe mark on the rim of the module housing directly opposite the distributor module timing mark, it is recommended that such a mark be placed on the rim.

1.3 Distributor Module Assembly (49).

a. Remove the two 3/8" x 6-32 F.H. fastening screws.

b. Lift the distributor module and receptacle from the housing, then disconnect the "P", or "P" and "N", lead(s) from the terminal(s) on the power module (43).

IMPORTANT

Remove a "P", or "P" and "N", lead(s) by pulling on the terminal clip. DO NOT PULL ON THE WIRE OR TWIST THE CLIP. It may be necessary to open the terminals slightly with a knife.

c. Remove the distributor module and receptacle from the housing.

NOTE

The distributor module is serviced as a complete assembly.

1.4 Spacing Washers (42).

a. Remove the spacing washers from the distributor gear shaft.

NOTE

Take care not to lose the spacing washers.

NOTE

Prior to disassembling the power module, make the tests outlined in paragraphs 3.14 and 3.15 on Page 7.

1.5 Power Module Assembly (43).

a. Disconnect the two coil leads from the power module. DO NOT PULL ON THE WIRES OR TWIST THE TERMINALS. It may be necessary to open the terminals slightly with a knife.

1.5 Power Module Assembly (43) Cont'd.

b. Remove the fastening screws or nuts (if present) and lockwashers.

c. Lift and remove the power module from the housing.

NOTE

The power module is serviced as a complete assembly.

1.6 Module Housing Assembly (38).

a. Remove the four fastening screws and lockwashers.

b. Lift the module housing from the magnetic housing (12); then draw the coil leads individually, through the rubber grommet.

c. Remove the module housing and gasket from the magnetic housing.

1.7 Distributor Gear (38), Ball Bearings (34) and Spacer (35).

NOTE

It is recommended that the ball bearings be replaced at each overhaul.

a. Remove the distributor gear from the module housing by hand.

b. Move the spacer (35) off center and then, using the spacer as a pressing tool, press the distributor gear end bearing from the housing.

c. Remove the spacer and the three ball bearing retaining screws (41), lockwashers (40) and washers (39).

d. Press out the remaining bearing.

1.8 Drive Gear (29) and Bearing Support Bracket (25).

a. Hold the inductor rotor (21) steady by assembling a TSE 418 coupling wrench (Bacharach Part #72-5208) to the lugs on the drive plate (4).

b. Remove the gear fastening nut (32) with a 7/16" wrench.

c. Remove the lockwasher (31), plain washer (30).

d. Remove the three fastening screws (28), lockwashers (27) and the coil lead retaining tab (26).

e. Insert two screw drivers into the slots on each side of the bracket and pry the bracket and drive gear from the housing and shaft.

f. Remove the spring washer (24).

1.9 Coil (20).

a. Loosen the two set screws (19) and remove the coil from the housing.

NOTE

If the set screws are locked in the housing, apply a heat lamp to the area adjacent to the screw holes.

1.10 Drive Plate (4).

IMPORTANT

Before removing the drive plate, note which keyway (#1 or #2) engages the Woodruff key so that the plate can be installed correctly at reassembly.

a. Hold the drive plate in place with the TSE 418 coupling wrench (Bacharach Part #72-5208).

b. Remove the fastening nut (2) with a 11/16" socket or box wrench.

c. Remove the lockwasher (3) and drive plate from the shaft.

1.11 Oil Seal Retaining Plate (7).

a. Remove the four oil seal retaining plate fastening screws (6). It is recommended that these screws be replaced at each overhaul.

b. Remove the oil seal retaining plate (7) and gasket (9). It is recommended that the gasket be replaced at each overhaul.

c. Pry the oil seal (8) from the retaining plate. It is recommended that the oil seal be replaced at each overhaul.

1.12 Inductor Rotor (21) & Ball Bearings (11&23).

NOTE

It is recommended that the inductor rotor ball bearings be replaced at each overhaul.

a. Support the rear of the bearing bore with TSE 52121 (Bacharach Part #72-5240) and press the inductor rotor from the housing.

b. Remove ball bearing (23) from the rotor shaft with TSE 52100 Ball Bearing Puller (Bacharach Part #72-5225), or equivalent.

c. Remove the drive end ball bearing (11) from the housing.

1.12 Inductor Rotor (21) & Ball Bearings (11 & 23). Cont'd.

NOTE

In early production Ignition Generators, the drive end bearing was assembled to the inductor rotor prior to the rotor being installed in the housing. When removing the inductor rotor from one of these units, the drive end bearing will remain on the rotor shaft and, therefore, must be removed with TSE 52100 Ball Bearing Puller (Bacharach Part #72-5225), or equivalent.

2. CLEANING

2.1 Metal Parts.

a. Clean the metal parts with Varsol, or comparable mineral spirits, and dry with clean compressed air.

NOTE

Metal parts that are extremely corroded or dirty can be soaked in any standard carburetor cleaner for approximately 30 minutes and then rinsed and dried as recommended by the cleaner manufacturer. The exterior of the housings can be cleaned with an abrasive pressure cleaner or wire brush wheel and then rinsed thoroughly with Varsol and dried with a clean air blast.

2.2 Distributor Gear (33).

a. Clean the gear with a soft brush (a Tampico brush is recommended) dipped in Varsol, or comparable mineral spirits, and dry with clean compressed air. DO NOT use a wire brush.

2.3 Power Module (43).

a. Clean with a soft bristle brush or a light air blast. If necessary, the insulation plate may be wiped clean with a soft cloth.

IMPORTANT

DO NOT immerse the power module or distributor module in cleaning fluid.

2.4 Distributor Module (49).

a. Wipe the metal plate with a soft cloth dampened with Varsol, or comparable mineral spirits, and air dry. DO NOT use compressed air.

b. Clean the small coils and related electronic circuitry with a soft bristle brush. DO NOT use compressed air.

3. INSPECTION (Visual)

Part	Inspect For
3.1 Drive Plate (4).	Excessively worn or damaged drive lugs or keyways.
3.2 Coil (20).	Cracked or damaged cable insulation - loose cable terminals - damaged or cracked end plates.
3.3 Magnetic Housing (12).	Damage - cracked or damaged boss in bearing bore.
3.4 Bearing Support Bracket (25).	Oversize ball bearing bore - I. D. should not exceed 1.2596".
3.5 Inductor Rotor (21).	Damaged threads - worn shaft (gear end) - loose shaft.
3.6 Drive Gear (29).	Burrs - cracks - loose fit to shaft - excessive tooth wear.

(Visual) Cont'd

Part	Inspect For
3.7 Distributor Gear Assembly (33).	Cracks - excessive tooth wear - worn shaft (magnetic distributor rotor end) - damaged threads.
3.8 Module Housing (38).	Oversize ball bearing bores - I. D. should not exceed 1.2592" (gear end) or 1.2598" (rotor end).
3.9 Power Module Assembly (43).	Damaged plate and/or components.
3.10 Distributor Module Assembly (49).	Cracked or damaged wire insulation - damaged and/or loose coil assemblies - damaged receptacle.
3.11 Distributor Rotor Assembly (51).	Loose plate (fingers) and/or magnet.
3.12 Cover (56).	Damage.

(Electrical)

Part	Test For
3.13 Distributor Module Assembly (49).	Pulsating voltage between each live receptacle and ground with a D.C. volt meter. The value of the voltage reading obtained is not important. Drive the ignition generator at 150 - 200 R.P.M.
3.14 Power Module Assembly (43).	Output voltage between terminal "P", and "N" if present, on the power module assembly and ground which should be 95 - 120 volts D.C. under the following conditions: a. Ignition generator driven at 300 RPM. b. "P", and "N" if present, lead(s) from the distributor module assembly disconnected from the power module assembly. c. 135 - 165 volts D.C. should be noted under the above conditions when using power modules PL 521092 or PL 521093 as in shielded Mag-Tronics. **NOTE** If the correct voltage reading cannot be obtained, either the coil is faulty or the magnets in the housing require remagnetizing.
3.15 Coil (20).	Continuity. Resistance is 67 - 73 ohms. Output voltage which should be 30 - 40 volts A.C. under the following conditions: a. Ignition generator driven at 300 RPM.

- Cont'd -

(Electrical) Cont'd

Part	Test For
	b. "F" and "S" lead disconnected from power module.
	c. Voltmeter connected to "S" and "F" leads.

NOTE

If the correct voltage reading cannot be obtained, either the coil is faulty or the magnets in the housing require remagnetizing.

ALWAYS REPLACE DAMAGED OR FAULTY PARTS WITH APPROVED AMERICAN BOSCH PARTS.

4. REMAGNETIZING

4.1 Magnetic Housing (12).

a. Determine the polarity of the poles of the magnetizer with a compass. The end of the compass needle that points to the geographic north pole will be attracted to the south pole and repelled by the north pole.

b. Assemble the magnetizing jaw, TSE 52116 (Bacharach Part #72-5238), to the magnetic housing and place them on the poles of the magnetizer (refer to Figure 4 - 1). The jaw that contacts the top of the pole shoe MUST be placed on the north pole of the magnetizer.

NOTE

The magnets MUST be remagnetized in the proper direction or the Ignition Generator timing will be adversely affected.

c. Operate the magnetizer in accordance with the manufacturer's instructions. The magnets should be subjected to three or four "charges" from the magnetizer. (Model "M" magnetizer, manufactured by H. G. Makelim Company, is an acceptable unit).

4.2 Distributor Rotor (51).

a. The stability of the charge in this magnet is such that it should not require remagnetizing during its service life.

5. LUBRICATION

NOTE

It is recommended that the components be lubricated at re-assembly.

5.1 Distributor Gear (33).

Apply a film of American Bosch LU3003 grease to the gear teeth.

5.2 Bearing Support Bracket (25).

Apply a film of American Bosch LU3003 grease to the I. D of the ball bearing liner.

5.3 Oil Seal (8).

Apply a thin film of American Bosch LU3003 grease to lip of seal and O.D. of shaft that it contacts.

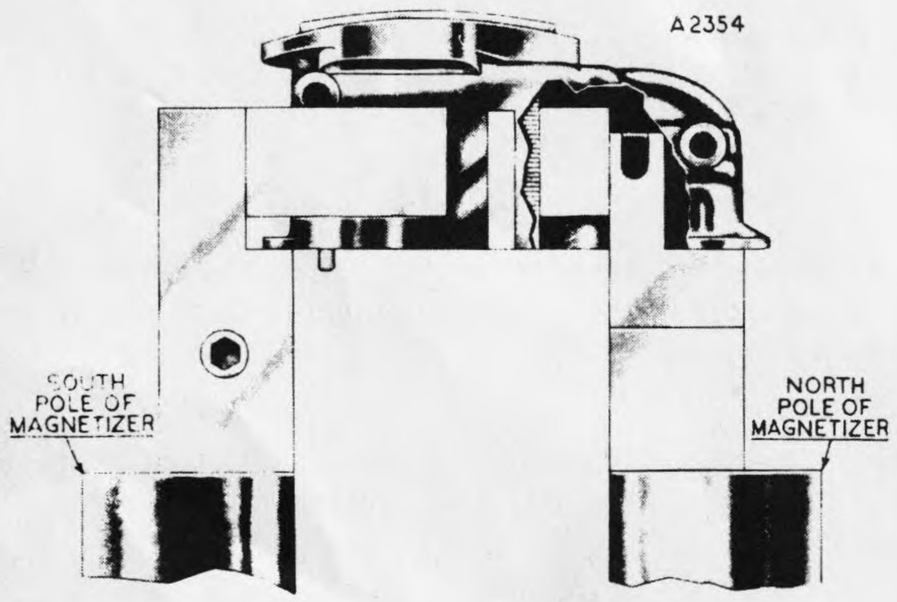

Figure 4-1 — Remagnetizing Magnetic Housing

6. REASSEMBLY

6.1 Inductor Rotor (21) and Ball Bearings (11 & 23).

a. Apply "Locktite Bearing Mount" to the bearing journals on the rotor shaft.

b. Press a new ball bearing (23) onto the gear end of the rotor shaft. Apply force to the inner race.

c. Install the inductor rotor in the housing (12).

d. Support the rear of the housing bearing bore with TSE 52121 (Bacharach Part # 72-5238), support the gear end of the rotor shaft and press a new ball bearing (11) onto the gear end of the shaft. Apply force to the inner race.

e. Allow the "Locktite Bearing Mount" to dry for 2 hours or bake the housing and rotor at 200° F. for 25 - 30 minutes.

NOTE

In early production Ignition Generators, the drive end bearing was assembled to the rotor shaft prior to the rotor being installed in the housing.

6.2 Bearing Support Bracket (25).

a. Assemble the spring washer (24), flat surface down, into the bearing bore.

b. Apply a film of LU3003 grease to the I.D. of the ball bearing liner.

c. Assemble the bracket by hand to the ball bearing and housing.

d. Secure the bracket with the upper and lower right hand fastening screws and lockwashers.

6.3 Oil Seal (8), Gasket (9) & Retaining Plate (7).

a. Assemble a new oil seal to the retaining plate (8) with the beveled edge facing up.

b. Apply a thin film of LU3003 grease to the lip of the seal and the O.D. of the shaft that it contacts.

c. Assemble the gasket (9) and retaining plate to the housing and secure with the four fastening screws (6). Tighten screws to a torque of 22 - 25 in. lbs.

6.4 Coil (20).

a. Assemble the coil to the pole shoes. Position the coil at the extreme rear of the housing.

b. Apply non-hardening Permatex to the lower half of the coil set screws (19) and secure the coil in place. Tighten the screws to a torque of 50 - 60 in. lbs.

c. Position the coil leads alongside the bearing support bracket (25) and hold them in place with the retaining tab that is secured with the remaining bearing support bracket fastening screw and lockwasher. Tighten the three bearing support bracket fastening screws (28) to a torque of 8 - 10 in lbs.

NOTE

At this point, the inductor rotor should be rotated by hand to check for a binding or rubbing condition which, if present, must be removed before proceeding.

6.5 Woodruff Key (5), if replaced, Drive Plate (4), Lockwasher (3) and Nut (2).

a. #1 keyway should engage the Woodruff Key.

NOTE

At this point, test the coil as outlined in Paragraph 3.15, Page 7.

6.6 Drive Gear (29).

a. Assemble the drive gear (29) to the inductor rotor shaft. If it is necessary to press the gear onto the shaft with an arbor press and pressing tool, support the drive end of the inductor rotor shaft.

b. Assemble the plain washer (30), lockwasher (31) and fastening nut (32) to the shaft. Hold the drive plate with a TSE-418 coupling wrench (Bacharach Part # 72-5208) and tighten the nut to a torque of 22 - 25 in. lbs.

6.7 Distributor Gear (33) and Ball Bearings (34).

a. Support the ball bearing bore section of the module housing (38) and press a new ball bearing into the distributor rotor end of the bore. Apply force to the outer race.

b. Lock the ball bearing in place with the washers (39), lockwashers (40) and screws (41).

c. Insert the distributor gear shaft into the ball bearing from the distributor rotor end. end.

- Cont'd -

6.7 Distributor Gear (33) and Ball Bearings (34). - Cont'd

d. Support the gear end of the shaft. Assemble the spacer (35) to the shaft, and press the second bearing into the module housing bore until it bottoms on the spacer. Apply force to the outer race.

e. Reassemble the distributor gear in its original position.

f. Apply a film of LU3003 grease to the gear teeth.

6.8 Module Housing (38).

NOTE

Setting the internal timing begins with the reassembly of the module housing to the magnetic housing.

a. Make certain that #1 keyway in the drive plate (4) engages the Woodruff key.

b. Place the timing mark on the drive plate (4) in the 12o'clock position.

c. Assemble the gasket (14) to the magnetic housing (12). It is recommended that the gasket be tacked to the housing with gasket glue, or equivalent.

d. Insert and pull the coil leads individually, through the grommet in the module housing. DO NOT engage the gears at this time.

e. Assemble the distributor module (49) to the module housing (38) temporarily; secure it in place with one fastening screw (50).

f. Assemble the distributor rotor (51) to the distributor gear shaft temporarily.

NOTE

The original distributor rotor must be used when setting internal timing, even when inspection indicates that the rotor should be replaced.

g. Align the leading edge of the longest rotor finger (in the direction of its normal rotation) with the timing mark on the distributor module plate. Hold the assembly and timing alignment as illustrated in figure 6-1.

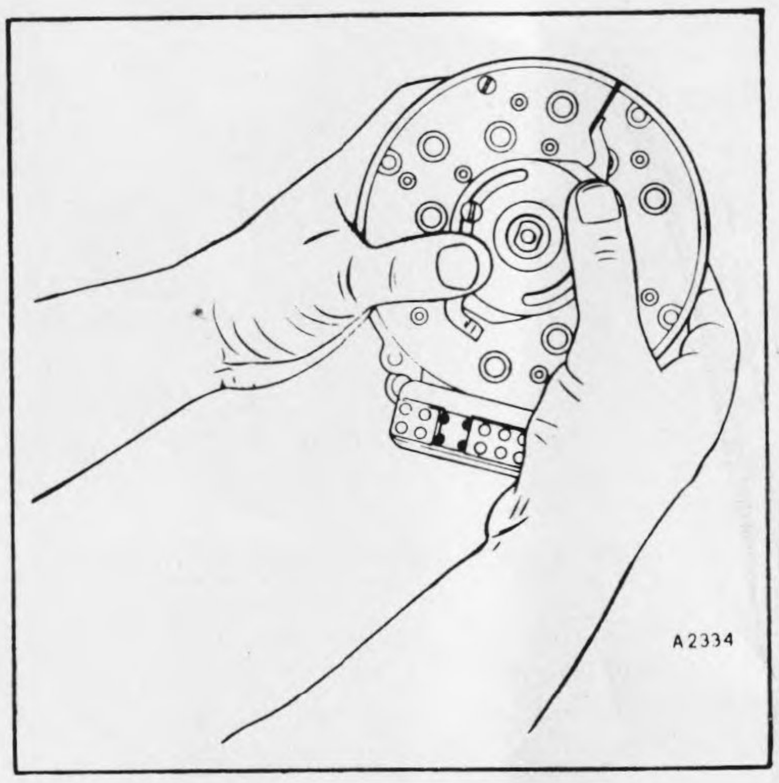

Figure 6-1 — Maintaining Timing Alignment — CCW Rotation

h. Lift the bottom of the module housing slightly and carefully engage the gears and the two locating pins in the bottom of the magnetic housing. Make certain that the rotor finger is still aligned with the timing mark on the distributor module plate.

i. Secure the module housing with the two lower fastening screws (48) and lockwashers (47).

j. Remove the distributor rotor and the distributor module.

k. Assemble the two upper fastening screws and lockwashers to the module housing. Tighten all four fastening screws to a torque of 22-25 in. lbs.

6.9 Power Module Assembly (43)

a. Assemble the power module to the module housing and secure it with the fastening screws or nuts (if present) and lockwashers. Tighten the screws to a torque of 8-10 in. lbs.

b. Connect the coil leads to the terminals on the power module plate as follows:

1. CW rotation (viewed from drive end) - "S" lead to "S" terminal. "F" lead to "F" terminal (refer to Figure 6-2).

2. CCW rotation (viewed from drive end) - "S" lead to "F" terminal. "F" lead to "S" terminal (refer to Figure 6-3).

3. Tighten the coil lead terminals with a pair of needle nose pliers.

6.9 Power Module Assembly (43). - Cont'd

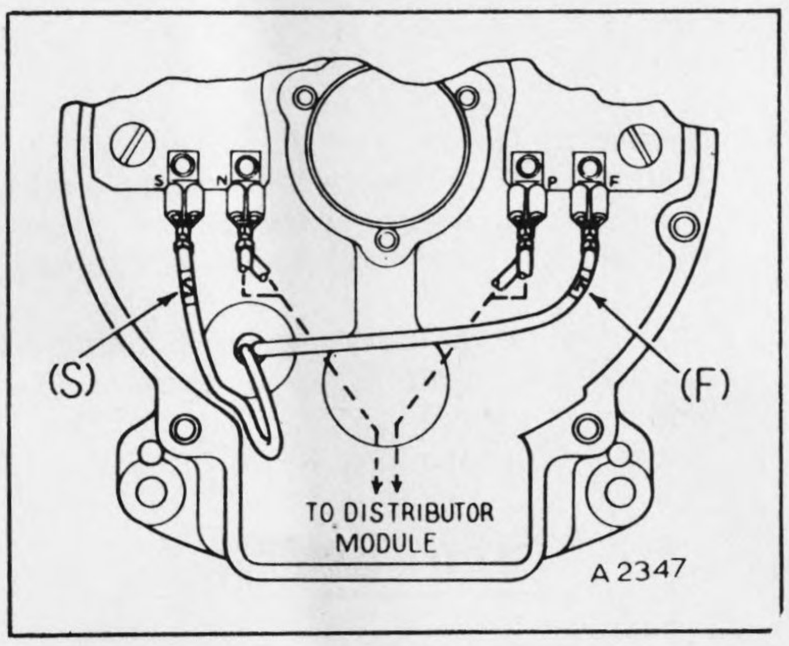

Figure 6-2 — Power Module Connections, CW Rotation

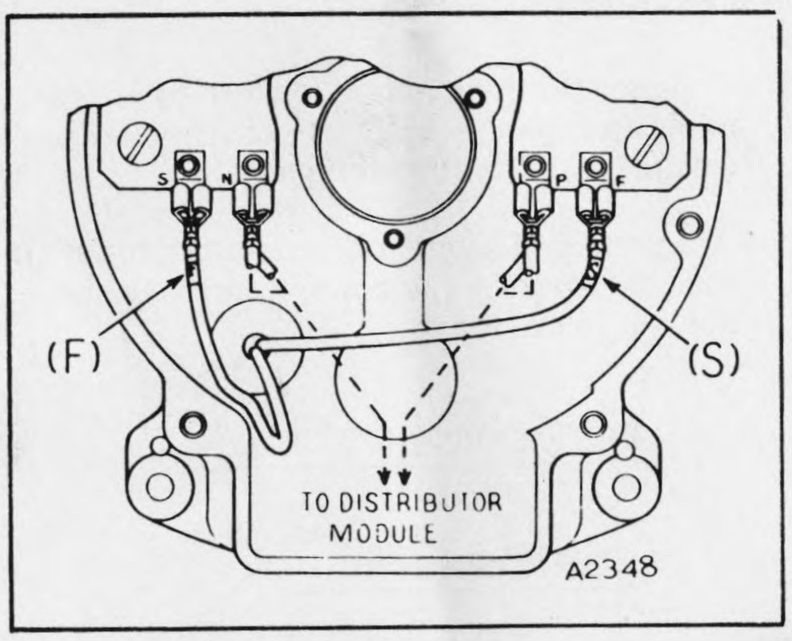

Figure 6-3 — Power Module Connections, CCW Rotation

NOTE

At this point, it is recommended that the voltage tests outlined in paragraph 3.14 on Page 7 be performed.

6.10 Distributor Module (49).

a. Connect the "P", or "P" and "N", lead(s) to the similarly marked terminal(s) on the power module (refer to Figure 6-2). Tighten the lead terminal(s) with a pair of needle nose pliers.

b. Assemble the distributor module to the module housing and secure it with the two fastening screws (50).

6.11 Distributor Rotor (51).

a. Reassemble the spacing washers (42) to the distributor gear shaft.

b. Assemble the distributor rotor to the shaft.

NOTE

If a new distributor rotor is being installed, follow the instructions packaged with the rotor.

c. Assemble the plain washer (52), lockwasher (53) and fastening nut (54) to the shaft. Tighten the nut to a torque of 22-25 in. lbs.

d. Rotate the drive plate (4) several times to make certain that all moving parts turn freely. If a binding condition exists, it must be corrected. DO NOT mistake magnetic lock, or drag, for a binding condition.

e. Temporarily assemble the cover fastening screws and lockwashers to the module housing and tighten the screws to a torque of 8-10 in. lbs.

- Continued -

6.11 Distributor Rotor (51) Cont'd.

f. Check the air gap between the rotor fingers and the triggering coil cores - this should measure .006 - .010" (refer to Figure 6-4). Should the air gap be other than that specified, adjust by adding or removing spacing washers (42) to the distributor gear shaft until the correct air gap is obtained - THIS IS IMPORTANT.

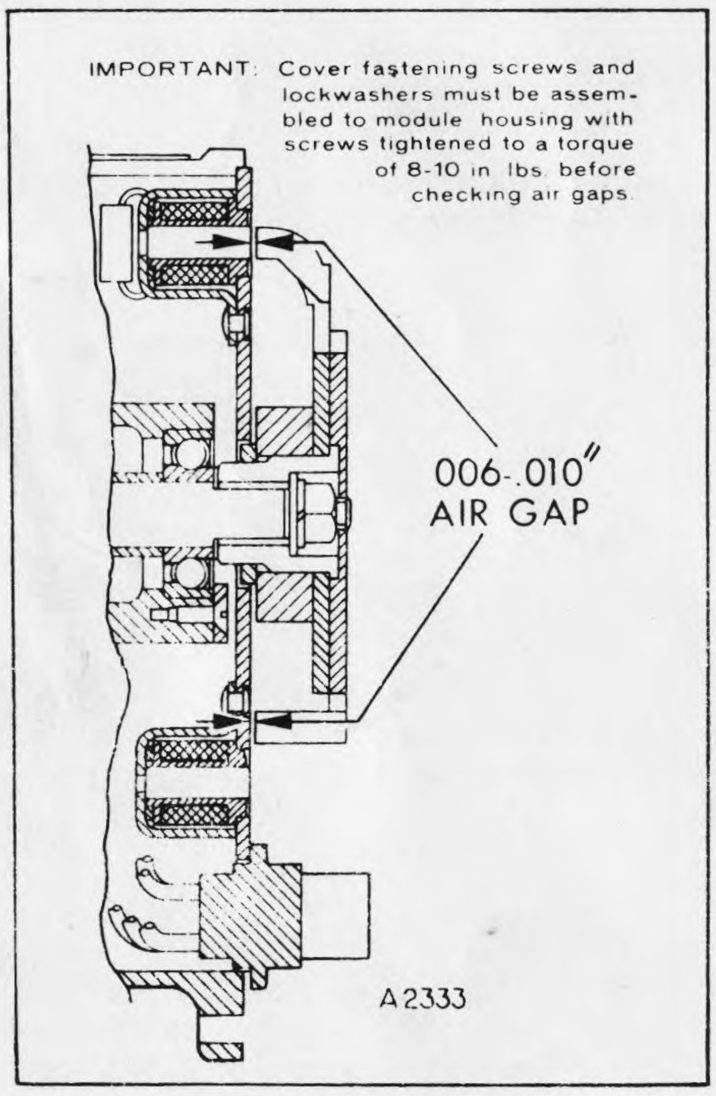

Figure 6-4 — Distributor Rotor to Coil Core Air Gap Dimension

g. Remove the cover fastening screws and lockwashers.

NOTE

Make certain that the distributor rotor fastening nut (54) is tightened to a torque of 22 - 25 in. lbs. following air gap adjustment.

6.12 Cover (56) and Gasket (55).

NOTE

Apply Permatex #2 to the portions of the cover gasket that contact the sides of the distributor module receptacle if water leakage is experienced in this area.

a. Assemble a new gasket to the module housing. Position in the bottom part of the gasket underneath the lip that extends around the distributor module receptacle.

b. Reassemble the cover to the housing and secure it with the fastening screws (58) and lockwashers (57). Tighten the screws to a torque of 8 - 10 in. lbs.

IMPORTANT

The drive plate (4) keyway (#1 or #2) that engaged the Woodruff key at disassembly must engage the Woodruff key when reassembly is completed. Make certain that the rotor shaft nut is tightened to a torque of 100 - 125 in. lbs.

7. PERFORMANCE TEST

a. Connect the ignition generator to an applicable number of TCD 90- ignition transformers and test spark gaps.

b. A serviceable ignition generator must fire the test spark gaps consistently at the speeds indicated:

TEST SPECIFICATIONS

Ignition Generator	Drive Shaft RPM	Test Spark Gap
All	250	7 mm
1-2-4-6 cyl.	3600	7 mm
8 - 12 cyl.	1900	7 mm

NOTE

The "P" and "N", or "P", leads of the wiring harness must be isolated from ground and each other.

c. If an Ignition Generator does not meet the foregoing test, perform the component tests outlined in paragraphs 3.13, 3.14 and 3.15, Page 7. Make certain that the coil set screws are securely tightened.

7. Performance Test Cont'd.

NOTE

If the ignition generator fires the gaps consistently, or intermittently, at low speed but ceases firing as speed is increased it is possible that the magnetic housing was magnetized incorrectly or the coil leads are connected to the power module incorrectly.

WIRING HARNESS

(Refer to (59 & 60) Figure 1-1)

1. DISASSEMBLY (Not applicable)

2. CLEANING

a. Wipe the terminal plug and cables with a clean cloth dampened with Varsol.

3. INSPECTION

a. VISUAL - Inspect the terminal plug and each cable for cracked insulation and damage. Use #14 stranded, heat resistant, insulated wire (Beldin Manufacturing Co. "MO 8510", or equivalent) for replacing a damaged or otherwise unserviceable length of cable. ALWAYS solder and insulate a spliced connection - DO NOT use acid flux.

b. ELECTRICAL - Check for continuity, which must exist, between the end of each cable and the related terminal in the terminal plug. Continuity must not exist between separate cables.

4. PERFORMANCE TEST (Not applicable)

IGNITION TRANSFORMER

(Refer to (61 & 63) Figure 1-1)

1. DISASSEMBLY (Not applicable)

2. CLEANING

a. Wipe clean with a cloth dampened with Varsol or an equivalent cleaning agent, especially around the primary terminals.

b. Should corona action adversely affect the high tension terminal and spring, remove and discard the latter and clean the terminal with a fine, brass wire brush; swab the terminal and the well with Varsol, then dry thoroughly; apply TSE 52115 Ignition Sealing Compound (Bacharach Part #72-5237) to the well, then assemble a new spring to the terminal.

3. INSPECTION

3.1 Visual

a. Inspect for cracked, broken or otherwise damaged terminals, or leads, and case.

3.2 Electrical

a. Check continuity, which must exist, between the :

1. Positive (+) L.T. terminal, or black wire, and the H.T. terminal. Resistance should be 3000 to 3400 ohms for the TCD90A1 and TCD90A4. Resistance for the TCG90A3 and TCG90-A4 should be 7300 - 7900, and the TCG90B4 should be 8800 - 9000 ohms.

2. Both L.T. terminals, or the black and white leads (refer to "B", Figure 3-1). Resistance should be .2 to .3 ohms on the TCD type, .5 to .6 ohms on the TCG90A3 and -90A4, and 11 to 13 ohms on the TCG90B4.

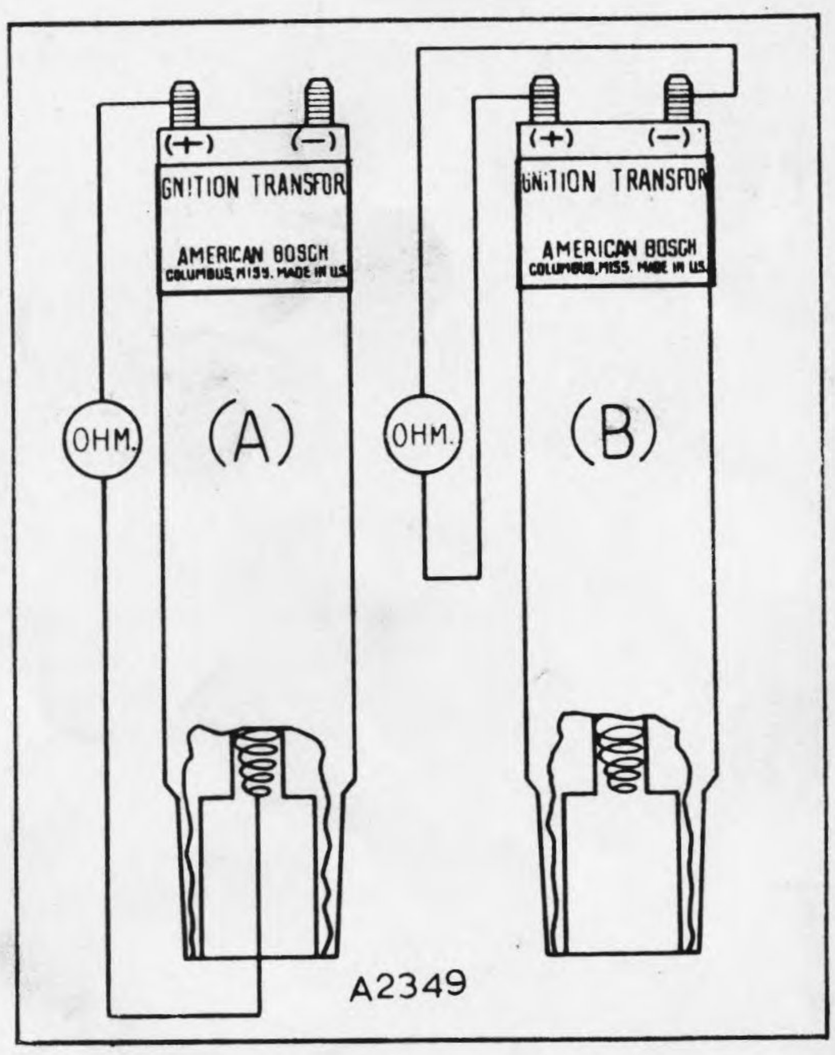

Figure 3-1 — Checking Transformer Continuity and Resistance

4. PERFORMANCE TEST

a. Substitute the transformer to be tested for a test transformer on the test stand and check in accordance with "Performance Test", Paragraph 7, Page 12. The test spark gap must be fired consistently.

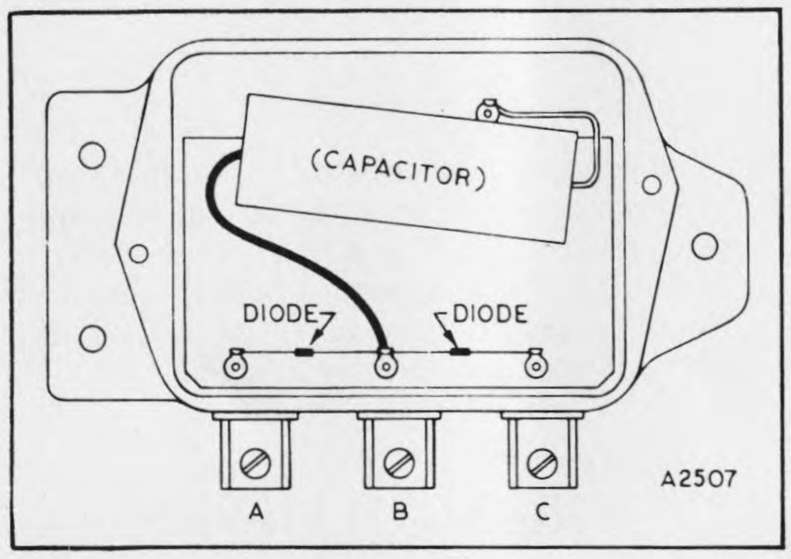

Figure 3-1A

SSA 101 SAFETY SWITCH ADAPTER

1. DISASSEMBLY (Not applicable)

2. CLEANING

a. Clean the base, insulation, and terminals with a cloth dampened in Varsol, or equivalent, and air dry. Take care not to damage the soldered connections.

3. INSPECTION

3.1 Visual.

a. Inspect for poor soldered connections, loose capacitor or cracked insulation.

3.2 Electrical.

a. Check for a ground condition, which must not exist, by placing an ohmmeter between the "A" terminal and the base, the "B" terminal and the base, and the "C" terminal and the base (See Figure 3-1A).

b. To check the diodes, proceed as follows:

1. Place an ohmmeter between the "A" and "B" terminals, then reverse the connections at the terminals. In one instance, there should be a deflection on the ohmmeter; in the other, the ohmmeter should show an open circuit.

   If a deflection occurs in both instances, the diode is shorted. If there is not a deflection in either instance, either the diode is open or there is a poor soldered connection.

2. Place an ohmmeter between the "B" and "C" terminals and proceed as in the preceeding paragraph 1.

c. Test the capacitor with a standard condenser tester.

4. PERFORMANCE TEST (Not applicable)

SSA 202 CIRCUIT ISOLATOR

1. DISASSEMBLY (Not applicable)

2. CLEANING

a. Wipe the entire isolator with a cloth dampened in Varsol, or equivalent, and air dry. Pay particular attention to the area around the terminals.

3. INSPECTION

3.1 Visual.

a. Loose terminals or damaged threads.

3.2 Electrical.

a. Check the diodes as follows:

1. Connect an ohmmeter between the "P" and "Switch" terminals, then reverse the connections. In one instance, there should be a deflection on the ohmmeter; in the other, the ohmmeter should show an open circuit.

   If a deflection occurs in both instances, the diode is shorted. If there is not a deflection in either instance, the diode is open.

2. Place the ohmmeter between the "N" and "Switch" terminals and proceed as in the preceding paragraph 1.

4. PERFORMANCE TEST (Not applicable)

INSTALLATION

1. TCD IGNITION TRANSFORMERS

TCD 90-A4S Ignition Transformers may be mounted in any position. However, mounting a transformer with the high tension terminal facing downward will reduce the possibility of moisture entering the well. Whenever a transformer is mounted otherwise, we recommend that American Bosch TSE 52115 (Bacharach Part #72-5237) Ignition Sealing Compound be placed in the well before inserting the high tension cable.

The TCD 90-1 Ignition Transformers are used in certain deep spark plug well installations and are equipped with integral primary lead extensions, and a contact spring in the high tension terminal well. This type of transformer is mounted directly above the spark plug.

a. Mount each transformer as close as possible to the spark plug. High tension leads must not exceed two feet in length. The 1" wide mounting bracket (64) will accommodate a 5/16" bolt.

NOTE

The contact spring is required only when mounting a transformer directly on a spark plug; remove it when mounting the transformer otherwise.

b. Ground the negative (-) primary terminal, or white wire, of each transformer to a paint free area on the engine with a short length of #14 stranded insulated wire.

c. Connect the high tension terminal of each transformer to a spark plug with a length (not over 2 ft. long) of ignition cable. The transformer end of the cable must be connected and soldered to a standard "U" type terminal (Available under American Bosch part number FP 81953).

NOTE

We recommend that all wire terminal connections be soldered, especially those in the primary (low tension) circuit of the system. DO NOT use acid or acid base flux when soldering.

2. MTC IGNITION GENERATOR

a. Set engine cylinder #1 in the correct firing position (refer to the engine manufacturer's instructions).

b. Rotate the ignition generator in the direction of rotation until the leading edge of the longest distributor rotor finger is in line with the O.D. of the coil core insulation. This times the unit to fire receptacle terminal "A" and engine cylinder #1.

NOTE

Regardless of rotation or the number of cylinders served, the firing order of the ignition generator at the receptacle is always in alphabetical sequence beginning with terminal "A".

c. Assemble the required drive disc (1) to the drive plate (4), then connect the ignition generator to the engine drive. The drive disc should have 1/32" axial float.

2.1 Flange Mounted Unit.

a. Draw up on the mounting bolts, or nuts, sufficiently to hold the unit in place; do not tighten until final timing is obtained. Make certain that the flange gasket is installed.

2.2 Base Mounted Unit.

a. Secure in place with the mounting bolts.

3. HAA WIRING HARNESS

An HAA- - - Wiring Harness consists of an applicable number of #14 A.W.G. stranded copper wires (leads) that are covered with a heat resistant insulation, and which terminate in a molded terminal plug that mates with the receptacle in the ignition generator. The free end of the wires are without terminals in order that they may meet a wide variety of customer application preferences.

Three basic wiring harness lengths are available; namely, 8 inches, 6 feet and 12 feet.

Each lead in the wiring harness is identified by a letter stamped into the insulation, and which corresponds with a similarly identi-

- Cont'd -

3. HAA Wiring Harness Cont'd.

fied terminal in the receptacle in the ignition generator. Regardless of rotation or the number of cylinders served, the firing order of the ignition generator at the receptacle terminals is always in alphabetical sequence, beginning with terminal "A".

Excepting leads "P" and "N", all of the leads in a wiring harness are connected to the spark plugs in accordance with the engine firing order.

A single pole ignition switch is applicable to a system that has one 4 or 6 cylinder Ignition Generator. A system that includes two 4 or 6 cylinder Ignition Generators or an 8 or 12 cylinder Ignition Generator requires a two pole switch unless the ground leads ("P" and "N") in the harness are connected to an SSA101 Safety Switch Adapter or an SSA202 Circuit Isolator. Never connect two ground leads to the same terminal.

a. Connect the harness terminal plug to the receptacle in the Ignition Generator. Make certain that the terminals are inserted all the way.

NOTE

On 8 and 12 cylinder engines equipped with Mag-tronic Ignition Systems, there is a possibility of electrical interaction between cylinders. Electrical interaction is caused when R.F. current is induced into alternate firing primary cables, thereby, prematurely actuating an electronic switch on the Ignition Generator's distributor module. Whenever alternate firing cables are routed in parallel for a distance of 6" or more, the cables for the inner row of trigger coils MUST BE isolated from the cables for the outer row. This can be accomplished by shielding all of the primary cables for either row of trigger coils.

EXAMPLE

8 Cylinders	Shield Leads A, C, E & G or B, D, F & H.
12 Cylinders	Shield Leads A, C, E, G, I & K or B, D, F, H, J & L.

Shielding is required on only one group of cables and only for the distance that the two groups parallel each other. See special instructions packaged with each 8 & 12 cylinder harness.

b. Connect harness lead "A" to the positive (+) primary terminal, or black wire of the ignition transformer at #1 engine cylinder.

NOTE

Connecting the harness leads to the positive (+) terminals and grounding the negative (-) terminals will result in a negative spark. For a positive spark, reverse the primary connections.

c. Connect the remaining harness leads to the positive (+) primary terminal of the other ignition transformers in accordance with the engine firing order. Keep in mind that the firing order at the receptacle is in alphabetical sequence beginning with terminal "A".

The harness leads may be cut to required lengths, but keep them as short as possible consistent with good installation practice.

d. Connect the harness "P", or "P" and "N", lead(s) to the ignition switch, Safety Switch Adapter or Circuit Isolator.

e. For best results, we recommend that the wiring harness be kept clear of hot areas on the engine.

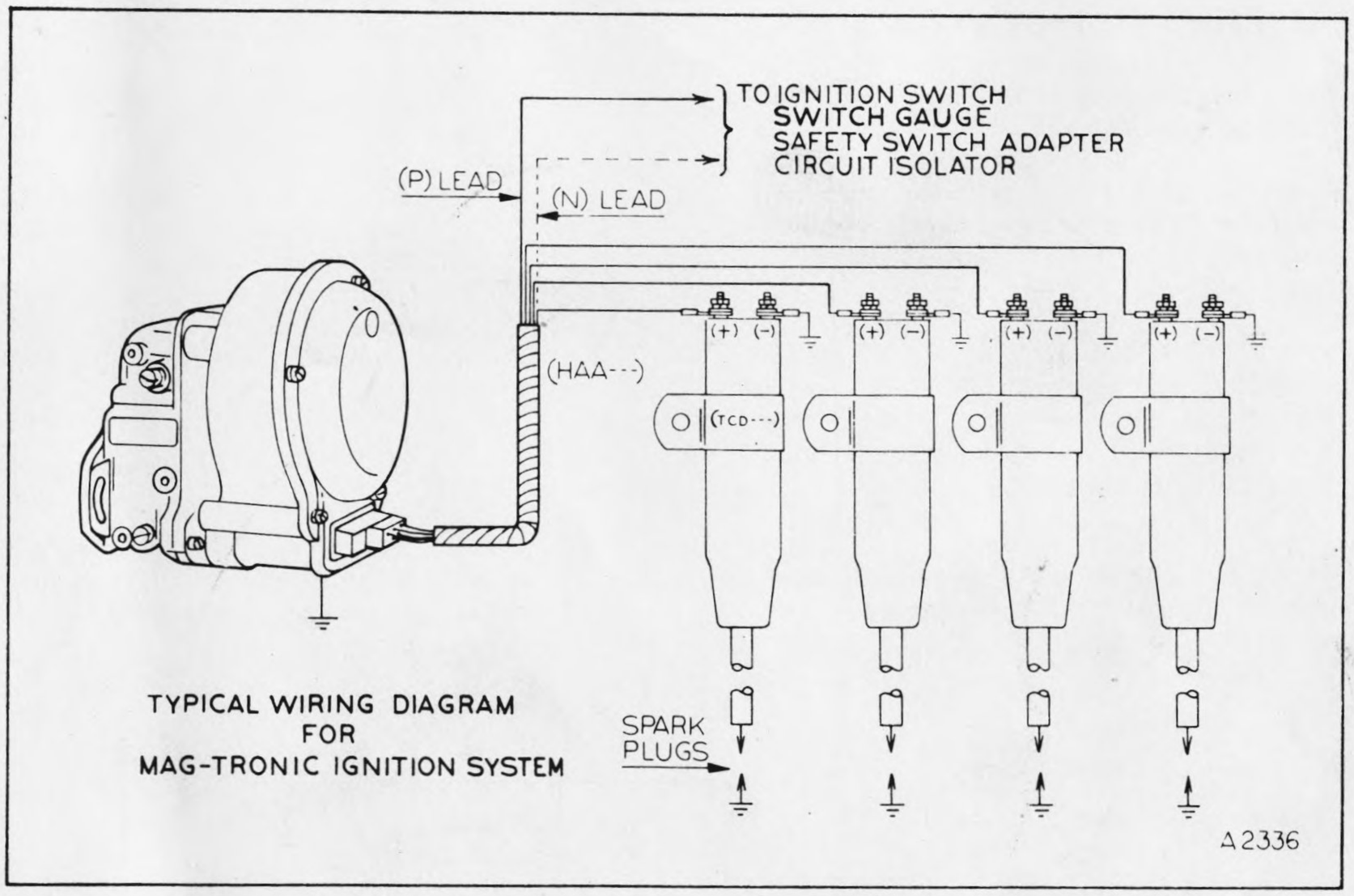

Figure 3-1B — Wiring Diagram

4. SSA 101 SAFETY SWITCH ADAPTER

Many engines are equipped with relay type safety switches that have manual reset buttons. These safety switches are normally activated by magneto primary current, approx. 3 amps. and a Mag-tronic Ignition System does not produce or require 3 amperes in the primary circuit. Therefore, when an engine is equipped with relay type safety switches, an SSA 101 safety switch adapter is required.

The SSA 101 incorporates a storage capacitor, two diodes, two input terminals (Ign. No. 1 & Ign. No. 2), and a safety switch terminal.

a. Connect the "P", pr "P" and "N", lead(s) in the HAA wiring harness to the input terminals. NEVER connect both leads to the same terminal (See "B", "D", "E" & "F", Figure 5-1).

NOTE

If the ignition system incorporates an SSA 202 circuit isolator between the ignition generator and adapter (See (E), Figure 5-1), connect the lead from the isolator "Switch" terminal to either adapter input terminal.

b. Connect #14 stranded, insulated cable between the "Switch" terminal and the "M-1" terminal on the safety switch.

NOTE

It is recommended that the SSA 101 be mounted in a clean, dry area where it will not be subjected to excessive vibration.

5. SSA 202 CIRCUIT ISOLATOR

SSA 202 circuit isolators are required under the following conditions:

1. System has two 4 or 6 cylinder ignition generators and the engine has a switch gauge(s) and/or a single pole ignition switch (See "A", Figure 5-1).

2. System has two 4 or 6 cylinder ignition generators and an SSA 101 safety switch adapter and the engine has a relay type safety switch(s), a switch gauge(s) and a single pole ignition switch (See "B", Figure 5-1).

3. System has one or two 8 or 12 cylinder ignition generators and the engine has a switch gauge(s) and a single pole ignition switch (See "C", Figure 5-1).

4. System has one or two 8 or 12 cylinder ignition generators and an SSA 101 safety switch adapter and the engine has a relay type safety switch(s), a switch gauge(s) and may or may not have a single pole ignition switch (See "D" & "E", Figure 5-1).

NOTE

Use #14 stranded, insulated cable between an SSA 202 and an SSA 101, ignition switch, switch gauge and safety switch.

Figure 5-1 — System Schematics

AMERICAN BOSCH MARKETING DIVISION AMBAC INDUSTRIES INC. SPRINGFIELD, MASS. 01107

FINAL TIMING

NOTE

Timing should always be checked and set with a timing light (Niehoff's Electronic Timing Light Model T-63, or equivalent) clipped around either the primary (L.T.) or secondary (H.T. cable of #1 ignition transformer and with the engine at normal operating speed.

1. Flange Mounted Ignition Generator

   a. With the engine operating at normal operating speed, rotate the entire unit towards or away from the engine block until exact timing is obtained. The flange slot(s) permit a 10° adjustment to each side of the centerline.

   b. Tighten the fastening bolts, or nuts, after final timing adjustment is completed.

2. Base Mounted Ignition Generator

   a. Stop the engine, remove the cotter pin and loosen the nut on the adjustable coupling.

   b. Turn the adjusting screw in order to rotate the adjustable flange until exact timing is obtained.

NOTE

Moving the adjustable flange in the direction of rotation will advance the spark and in the opposite direction will retard the spark.

   c. Make certain that the coupling is adequately secured after exact timing is obtained.

PERIODIC MAINTENANCE

1. Ignition Transformer

   a. Wipe clean with a cloth dampened with Varsol or an equivalent agent, especially around the primary terminals.

   b. Check the primary terminal connections for security.

   c. Make certain that the high tension ignition cable is inserted all the way into the high tension contact well.

   d. Check each transformer for mounting security.

   e. Check for adverse affects of corona action on the high tension terminal and spring. If present, proceed as follows:

      1. Remove and discard the spring, if present.
      2. Remove any Ignition Compound that is in the well.
      3. Clean the terminal with a fine, brass wire brush.
      4. Swab the terminal and the well with Varsol, then dry with compressed air.
      5. Apply TSE 52115 Ignition Sealing compound (Bacharach Part #72-5237) to the terminal and the well.
      6. Assemble a new spring to the high tension terminal if the transformer is mounted on the spark plug.

2. Ignition Generator

   a. Clean the outside with a cloth dampened with Varsol.
   b. Check the unit for mounting security.
   c. Check the security of the harness terminal plug and receptacle connection.
   d. Check the condition of the drive disc. If damaged or worn excessively, replace it with a new one. The drive disc should have 1/32" axial float.

NOTE

DO NOT open this unit for periodic inspection, it is not necessary or required.

3. Wiring Harness

   a. Inspect for chafed or cracked insulation or otherwise damaged leads. Deteriorated or damaged leads may be replaced with #14 stranded, heat resistant, insulated wire (Beldin Manufacturing Co., "MO8510", or equivalent). ALWAYS solder and insulate a spliced connection. DO NOT use acid or acid base flux when soldering.

NOTE

Check the timing of the ignition generator to the engine with a timing light. If re-adjustment is required, see "Final Timing", above.

TOLERANCES

1. Electrical

Part		Permissible Tolerance Minimum	Maximum
Coil (20)			
Resistance	A & B edition magtronic	67 Ohms	73 Ohms
	"C" edition magtronic	150 Ohms	160 Ohms
Voltage (Para. 3.15, page 7)		30V AC	40V AC
Ignition Transformer (61 and 63)			
Primary Resistance	TCD90A1, -90A4	.2 Ohms	.3 Ohms
	TCG90A3, -90A4	.5 Ohms	.6 Ohms
	TCG90B4	11 Ohms	13 Ohms
Secondary Resistance	TCD90A1, -90A2	3000 Ohms	3400 Ohms
	TCG90A3, -90A4	7300 Ohms	7900 Ohms
	TCG9034	8800 Ohms	9000 Ohms
Power Module (43)			
Voltage (Para. 3.14, page 7)			
With standard module		95V DC	125V DC
With PL521092, -1093 for shielded systems		135V DC	165V DC

2. Mechanical

Ball Bearing Bores		
Bearing Support Bracket (25)	1.2593"	1.2596"
Module Housing Assembly (38)		
Gear End	1.2589"	1.2592"
Rotor End	1.2589"	1.2598"
Distributor		
Rotor to coil core air gap		
(refer to Figure 6-4, page 12)	.006"	.010"

3. Torques

Fastening Nut (drive plate) (2)	100 in. lbs.	125 in. lbs
Fastening Screws (oil seal retaining plate) (6)	22 in. lbs.	25 in. lbs.
Set Screw (Coil) (19)	50 in. lbs.	60 in. lbs.
Fastening Screws (Bearing Support Bracket) (28)	8 in. lbs.	10 in. lbs.

3. Torques - Continued -

Part	Permissible Tolerance Minimum	Maximum
Fastening Nut (Drive Gear) (32)	22 in. lbs.	25 in. lbs.
Fastening Screws (Power Module) (45)	8 in. lbs.	12 in. lbs.
Fastening Screws (Module Housing) (48)	22 in. lbs.	25 in. lbs.
Fastening Nut (Distributor Rotor) (54)	22 in. lbs.	25 in. lbs.
Fastening Screws (Cover) (58)	8 in. lbs.	10 in. lbs.

OPERATING TEMPERATURE LIMITS

Unit	Maximum Ambient Operating Temperature
MTC Ignition Generator	200° F.
HAA Wiring Harness	220° F.
TCD 90-1 Ignition Transformer	300° F.
TCD 90-4S Ignition Transformer	300° F.
SSA 101 Safety Switch Adapter	180° F.
SSA 202 Circuit Isolator	200° F.

SPECIAL TOOLS

LU 3003 Grease (Supplied by American Bosch)

Magnetizer (*Makelim Model "M", or equivalent)

TSE 418 Coupling Wrench (Bacharach Part #72-5208)

TSE 52100 Ball Bearing Puller (Bacharach Part #72-5225)

TSE 52115 Ignition Sealing Compound (Bacharach Part #72-5237)

TSE 52116 Magnetizing Jaws (Bacharach Part #72-5238)

TSE 52121 Support Tool (Bacharach Part #72-5240)

* Available from H G. Makelim Co., 660 Bryant St., San Francisco, California 94107

TROUBLE SHOOTING

Trouble	Possible Cause	Remedy
One or two cylinders mis-fire.	Faulty spark plug(s).	Replace spark plug(s).
	Poor transformer ground(s).	Securely ground transformer(s).
	Loose primary connections.	Tighten connections.
	Moisture and/or dirt in transformer high tension well.	Clean well and place TSE 52115 Ignition Sealing Compound (Bacharach Part #72-5237) in well.
	Faulty transformer(s) (See para. 3.2, page 13).	Replace transformer(s).
	Grounded or open wiring harness lead(s).	Remove ground or replace lead(s). When splicing on a new lead, use #14 stranded, heat resistant, insulated wire (Belden Mfg. Co.'s "MO 8510" or equivalent). ALWAYS solder and insulate a spliced connection. DO NOT use acid flux.
	Faulty trigger coil(s) or SCR(s) (See para. 3.13, page 7).	Replace distributor module (49).
Intermittent mis-fire on all cylinders.	Loose cable connections at power module (43).	Tighten cable connections with needle nose pliers.
	Poor ground at power module (43).	Tighten the module fastening screws.
	Coil (20) not secured in housing.	Tighten set screws (19).
All even or all odd numbered cylinders on an 8 or 12 cylinder engine mis-fire.	Poor ground at power module (43).	Tighten the module fastening screws.
	Faulty power module (43). (See para. 3.14, page 7).	Replace power module.
	Shorted diode in SSA 101 (See para. 3.2, b & c, page 14) or SSA 202 (See para. 3.2, page 14).	Replace SSA 101 or SSA 202.
	Shorted or grounded coil lead.	Repair lead or replace coil.
	Shorted SCR on distributor module (49).	Replace distributor module.
Engine will not start.	Insufficient cranking speed.	Ignition generator drive shaft must rotate a 150 R.P.M. minimum.
	Relay type safety switch not reset.	Reset safety switch.
	Incorrect timing between ignition generator and engine.	Adjust timing.
	Shorted diode in SSA 101 (See para. 3.2, b & c, page 14).	Replace SSA 101.

Trouble Shooting - Cont'd -

Trouble	Possible Cause	Remedy
Engine will not start. (Cont'd.)		
	Grounded SSA 101 (See para. 3.1, page 14).	Replace SSA 101.
	Shorted diode in SSA 202 (See para. 3.1, page 14).	Replace SSA 202.
	Grounded:	
	a. "P" or "N" lead.	Remove ground condition.
	b. Lead between SSA 101 switch terminal and safety switch.	Remove ground condition.
	c. Lead between SSA 202 and ignition switch, switch gauge(s) or SSA 101.	Remove ground condition.
	d. Lead between safety switch(s) and switch gauge(s).	Remove ground condition.
	Faulty ignition generator:	
	a. Incorrect internal timing (See para. 6.8, page 10).	Correct internal timing.
	b. Faulty distributor rotor (51).	Replace rotor.
	c. Loose cable connections at power module (43).	Tighten cable connections with needle nose pliers.
	d. Poor ground at power module (43).	Tighten fastening screws.
	e. Faulty power module (43). (See para. 3.14, page 7).	Replace power module.
	f. Open, shorted or grounded coil lead.	Repair lead or replace coil.
	g. Faulty coil (See para. 3.15, page 7).	Replace coil.
	h. Faulty ignition switch.	Replace switch.
Safety switch will not actuate.	Faulty SSA 101.	Replace SSA 101.
	Open circuit in lead between 101 and safety switch.	Replace lead with #14 stranded, insulated cable.