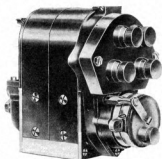


AMERICAN BOSCH PRODUCTS

REPAIR INSTRUCTIONS FOR AMERICAN BOSCH HIGH TENSION MAGNETO TYPE ZR

TRADE MARK  AMERICAN BOSCH



The Type ZR-4 American Bosch Magneto

THE high tension American Bosch Magnetos, Types ZR4 and ZR6 are used respectively on four and six cylinder automobile and marine engines.

The ZR magnetos are usually employed as sole ignition on an engine, or, in some cases, in connection with a battery system operating on a separate set of spark plugs. The ZR types are also used in conjunction with the American Bosch Vibrating Duplex Ignition System, to provide battery and magneto ignition on one set of spark plugs. The American Bosch Independent Magnetos, ZR Types, are those described in these instructions.

Generation of Current

Like other high tension Magnetos manufactured by the United American Bosch Corporation, the ZR types generate high tension current directly in the magneto armature (the rotating member of the magneto) without the aid of a separate step-up coil, and have their timer and distributor integral.

The armature winding is composed of two sizes of wire, one size comparatively heavy and the other very fine. The heavy wire constitutes the primary or low tension circuit and the very fine wire the secondary or high tension circuit.

The rotation of the armature between the poles of strong permanent magnets sets up or induces a current in the armature primary circuit, and this is further augmented at regular intervals, in the rotation of the

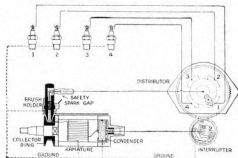
armature shaft, by the abrupt interruption of the primary circuit, by means of the magneto interrupter. At the opening of the primary circuit, the resulting discharge of current from that circuit induces a current of high voltage in the armature secondary circuit. The high tension current thus created is collected by the collector ring on the armature and passed through the collector brush, then to the various magneto distributor terminals, each of which is connected by cable to the spark plug in its respective cylinder. See circuit diagram.

The Safety Spark Gap

In order to protect the armature winding and other current carrying parts, a safety spark gap is provided on the magneto. This safety gap consists of a pointed metal electrode projecting from the mounting flange of the collector brush-holder, inside the waterproof hood, the tip of the electrode extending within a short distance of the metal part of the conducting rod.

Under normal conditions the current will follow its path through the conducting rod and distributor plate to the spark plug. If for any reason the electrical resistance of the secondary circuit is increased to a high point, as when a cable is disconnected or a spark plug gap is too wide, the high tension current will discharge across the safety gap.

The voltage should never be allowed to jump across the safety spark gap for any length of time; the snapping sound by which the passage may be detected should always lead to an immediate search for the cause of the difficulty.



Circuit Diagram Type ZR-4 Magneto

Note:—Spark plugs must be connected in accordance with firing order of engine

Care and Maintenance—Lubrication.

Aside from keeping the magneto clean externally, practically the only care required is oiling of the bearings; of these, there are two ball bearings supporting the armature, and, a bronze bearing supporting the shaft of the distributor gear.

We recommend the use of Bosch US-506 magneto oil for this purpose (never use cylinder oil), and each of the oilers should receive not more than two or three drops about every 500 miles.

Wipe off any dirt that may have accumulated.

The interrupter is intended to operate without lubrication, and as oil on the platinum interrupter contacts will prevent good contact, cause sparking and burning, as well as misfiring, care should be exercised to prevent the entrance of oil to these parts.

Starting the Engine

Engines equipped with ZR magnetos should be cranked with the spark lever slightly advanced. If the magneto has been timed according to instructions, the spark lever may be safely advanced about one-third, or even one-half on engines equipped with starting motors.

Trouble—Cause and Remedy

In case of defective ignition it must first be determined whether the fault is in the magneto, or as is more probable, elsewhere. In general, when only one cylinder misfires, the fault is in the spark plug, the most common plug difficulties being as follows:

Plug Gap Too Wide

The distance between the electrodes of the spark plug varies according to the individuality of the engine, but normally this distance should not be less than 1/50th inch. On the other hand, however, too wide a gap increases the electrical resistance, and interferes with the proper generation of current at low speed. Difficulty in starting an engine and missing at low speeds are very often due to the spark plug gaps being too wide and, as the spark will have a tendency to burn the electrodes and thereby gradually increase the gap, it is especially important that the plugs be examined occasionally to see that the gap is not too great; any difficulty due to this cause may be readily overcome by readjusting the electrodes.

Plug Short-Circuited

This is usually caused by a cracked or porous insulator, or by fouling of the electrodes or insulator. Any of these conditions will cause misfiring by permitting the current to stray from its intended path.

Cables

Misfiring of one cylinder, either continuous or intermittent, may be due also to a chafed or broken

cable or a loose cable connection. The metal terminals of the cables must not come into contact with any metal parts of the engine or the magneto, except those designated as being correct according to the instructions given.

Irregular Firing

If the cables and plugs are in good condition, and yet the ignition is irregular, the trouble is probably with the magneto, and the interrupter should be carefully examined. It should be seen that the interrupter lever moves freely on its pivot and that the hexagon headed fastening screw in the center of the interrupter is properly tightened.

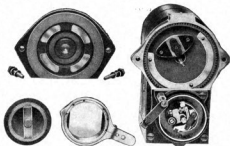
Platinum Interrupter Contacts

The platinum interrupter contacts should be examined for the correctness of their adjustment, and they should be so set that they are separated by a distance of 0.4 of a millimeter (about 1/64th inch) when the fibre block in the interrupter lever is resting in the center of either of the cams in the interrupter housing. The strip of steel attached to the magneto adjusting wrench, which is furnished with each magneto, is to be used as a gauge for this distance. The adjustment of the platinum interrupter contacts may be made by loosening the lock nut of the long contact screw, which passes through the interrupter contact block, and turning the hexagon head of the screw itself with the magneto adjusting wrench. When the adjustment is made, care should be taken to tighten the lock nut firmly.

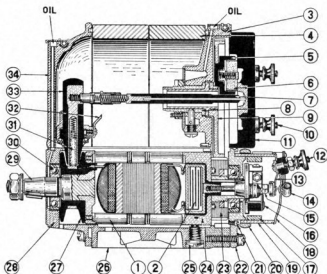
The platinum contacts of the interrupter should be clean and in proper alignment with each other, and any oil, grease or dirt that is deposited on them should be removed. If they are uneven or in bad condition (but only then) they may be smoothed by means of a fine, flat, jeweler's file.



Magneto Wrench



View with distributor plate and interrupter housing removed, showing distributor segments, distributor brush, interrupter, etc.



Type ZR Magneto

1. Armature wound core
Note: Complete armature consists of parts indicated by the the following numbers: 29, 1, 2, 24 and 27.
2. Condenser
3. Gear housing
4. Magnet
5. Distributor brush holder
6. Distributor brush
7. Conducting bar
8. Distributor gear bearing
9. Distributor gear
10. Distributor plate terminal screw
11. Distributor plate
12. End cap terminal screw
13. End cap contact spring with brush
14. End cap holding post and spring
15. Interrupter fastening screw
16. Interrupter complete
17. Interrupter cam
18. Magneto end cap
19. Interrupter housing
20. Timing arm
21. Interrupter housing stop screw
22. Rear end plate
23. Armature gear
24. Armature flange—condenser end
25. Grounding brush with holding screw
26. Base plate
27. Collector ring
28. Shaft
29. Driving end plate
30. Ball bearing—either end
31. Collector brush
32. Safety gap electrode
33. Collector brush holder
34. Waterproof hood

Damaged Insulating Parts

As it sometimes happens that brush holders and other insulating parts of the magneto are damaged through accident or carelessness, these parts should also be carefully examined for possible disarrangement or damage of the insulation which might permit leakage of current.

Driving Speeds — Installation

Since the magneto produces an ignition spark only, at certain definite points in the rotation of its armature it must be connected to the engine in such a manner that the spark is available always at the instant when required in the cylinder, i.e., about top dead center of the compression stroke. The magneto, therefore, must be positively driven from the engine by a chain or gears. The Type ZR6 magneto, producing two sparks per revolution of its armature shaft, must be driven at one and one-half times engine speed for six-cylinder, four-cycle engines, and at three times engine speed for six-cylinder, two-cycle engines. The Type ZR4 must be driven at engine speed (crank shaft speed) for four-cylinder, four-cycle engines, and at twice engine speed for four-cylinder, two-cycle engines.

Timing the Magneto

The crank shaft is rotated to bring the piston of No. 1 cylinder (in automobile practice this is the cylinder nearest the radiator) exactly on top dead center of the compression stroke, and the piston is to be maintained in that position. The magneto is then to be se-

cured to its bracket or bed on the engine, and the timing control arm on the interrupter housing placed in the fully retarded position.

With that done, the magneto distributor plate should be removed exposing the distributor gear and brush. The cover of the magneto interrupter housing is also to be removed to permit observation of the interrupter.

The armature should then be rotated by means of the exposed distributor gear in the direction in which it is to be driven, until the platinum interrupter contacts are just about to separate, which occurs when the interrupter lever begins to bear against one of the steel segments of the interrupter housing.

The armature should be held in that position while the magneto drive is connected to the engine, due care being taken that the piston of No. 1 cylinder is still exactly on top dead center of the compression stroke. The installation is completed by replacing the interrupter housing cover and distributor plate, and connecting the cables between the magneto and spark plugs. (See circuit diagram.)

Exact Magneto Timing

The foregoing will establish the desired relationship between the magneto armature and the engine crank shaft. It should be noted, however, that while these instructions cover the average engine, the exact magneto timing for individual engines is best determined by trial. Where specific instructions for magneto timing are given by the engine manufacturers, it is recommended that such instructions be followed in preference to those herein given.