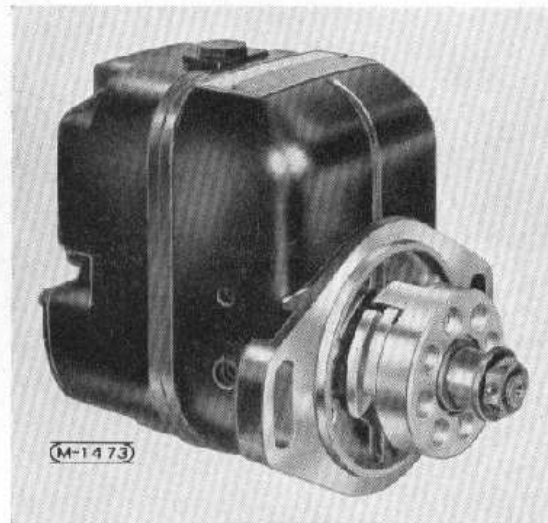


User Operating Instructions

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

Types S4RN-20, S4RN-21, S4LN-20, S4LN-21,
S6RN-20, S6RN-21, S6LN-20 S6LN-21



Magneto, Type S6RN-21



SCINTILLA MAGNETO DIVISION

BENDIX AVIATION CORPORATION

SIDNEY, NEW YORK, U. S. A.

GENERAL DESCRIPTION

The Bendix-Scintilla S4 and S6 series magnetos are designed for use on four and six cylinder aircraft engines.

The two pole rotating magnet is mounted in the housing on two annular ball bearings. On the rear extension of the magnet shaft is the breaker cam.

The contact and cam follower assembly, incorporating a lubricating felt attached to the cam follower, is secured to the housing with two screws. The coil is secured with two clamps, two screws, and lock washer. The primary lead from the coil is secured directly to the adjustable contact assembly. The secondary lead is grounded to the housing. The two sections of the magneto are held together with five screws.

INSTALLATION

Before installing the magneto on the engine make sure that it has been properly checked and inspected.

Turn the engine crankshaft to the correct firing position as directed by the engine manufacturer's instructions.

Note: The special breaker grounding spring used on these magnetos short-circuits the primary at all times when the ground terminal is not installed. To prevent this from interfering with the action of the timing light, an insulating strip of heavy paper should be placed between the breaker grounding spring and the magneto housing. (See Figure 1.)



Figure 1. Paper Insulating Strip Under Breaker Grounding Spring

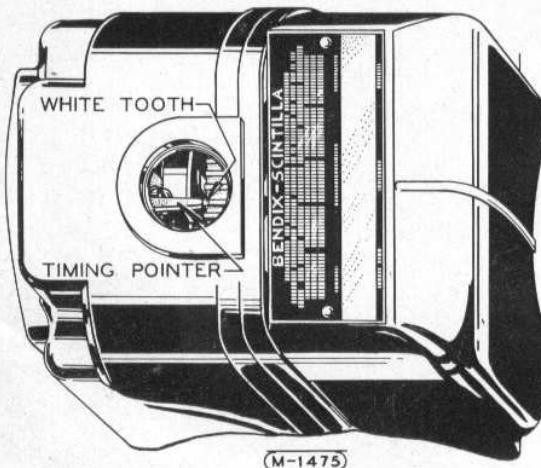


Figure 2. Timing Marks Which Indicate No. 1 Firing Position of Magneto

Remove the timing inspection plug and the breaker cover from the magneto, look into the timing inspection hole and turn the magneto until the white tooth is lined up with the timing pointer next to it. Install the magneto on the engine. (See Figure 2.)

Connect Scintilla No. 11-851 timing light, or equivalent across the breaker points of the magneto and rotate the magneto through the angle provided by the elongated slots in the mounting flange until the timing indicates that the points are just opening on No. 1 cylinder.

Warning: Do not fail to remove the paper strip from the magneto after the timing is finished. Failure to do so would make it electrically impossible to switch off the ignition, thereby creating a hazard to personnel.

Connect the ground wire to the ground terminal connection on the breaker housing.

Connect the high tension cables to the distributor of the magneto. The high tension outlet marked "1" is to be connected to the No. 1 cylinder.

INSPECTION AND MAINTENANCE

The ball bearings of the magneto are packed in grease and require no lubrication except when the magneto is disassembled for overhaul. At such time the grease should be washed out and the bearings repacked with ANDOK "C" grease.

At routine inspection intervals, remove the breaker cover and inspect the breaker. Turn the engine until the timing marks line up correctly. (See "Installation"). With the marks lined up, the breaker should be just starting to open. If the points do not breaker at this position, loosen the screw in the slotted hole of the breaker assembly and shift the breaker slightly so that the points just break contact when the marks line up. (See Figure 3.)

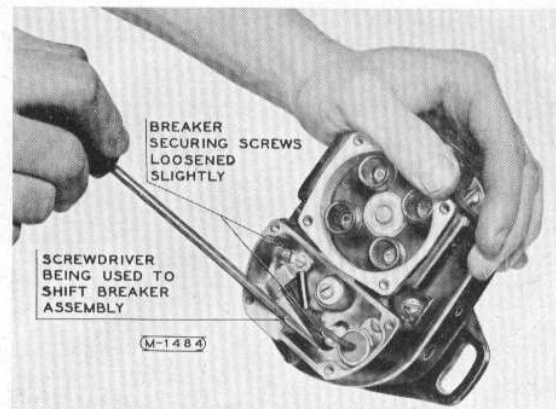


Figure 3. Adjusting the Breaker Points

If the breaker points are oily, they can be cleaned with a little clear gasoline. Avoid getting the gasoline on the breaker as the cam is impregnated with lubricant, which would be washed away by the gasoline.

If the breaker points are burned or worn excessively, do not try to redress the contact surfaces. Install a complete new breaker assembly if they are found in an unsatisfactory condition.

Warning: Do not under any circumstances remove the five screws which hold the two sections of the magneto together, while the magneto is on the engine. To do so would disengage the distributor gears, causing the distributor timing to be "lost" and necessitating complete removal and retiming of the magneto.

SERVICE INSTRUCTIONS

BENDIX-SCINTILLA AIRCRAFT ENGINES

Types S4RN-20, S4RN-21, S4LN-20, S4LN-21,
S6RN-20, S6RN-21, S6LN-20, S6LN-21



SCINTILLA MAGNETO DIVISION

BENDIX AVIATION CORPORATION

SIDNEY, NEW YORK, U. S. A.

PRINTED
IN
U.S.A.

FORM L-205-1

SECTION I

DESCRIPTION

The Bendix-Scintilla S4 and S6 series magnetos are designed for use on four and six cylinder aircraft engines. These magnetos employ two pole rotating magnets and consequently the S4 (four cylinder types) are driven at engine crankshaft speed and the S6 (six cylinder) types are driven at 1-1/2 engine speed.



Fig. 1. Bendix-Scintilla Magneto Type S6RN-21, 3/4
Front View



Fig. 2. Bendix-Scintilla Magneto Type S6RN-21, 3/4
Rear View

SECTION II

INSTALLATION

As a precaution, check the adjustment of the magneto breaker before placing the magneto in service on an engine. Remove the timing inspection plug and the breaker cover from the magneto. Look into the timing inspection hole and turn magneto until the white tooth on the large gear is lined up with the timing line or pointer next to it. (See figure 3.) The breaker points should be just starting to open when these marks line up. Scintilla timing light No. 11-851, or equivalent, should be used to determine when the breaker opens. If the breaker does not open at the proper position, readjust as outlined under Maintenance.

Note: The special breaker grounding spring used on these magnetos short-circuits the primary at all times when the ground terminal is not installed. To prevent this from interfering with the action of the timing light, an insulating strip of heavy paper should be placed between the breaker grounding spring and the magneto housing.

Warning: Do not fail to remove the paper strip from the magneto after the timing is finished. If the paper strip were inadvertently left in the magneto it would be electrically impossible to switch off the ignition, thereby creating a hazard to personnel.

If the magneto incorporates an impulse coupling it will be found that the coupling prevents turning the magneto in its normal rotation unless the coupling pawl is disengaged. This can be done by depressing the pawl with the finger as shown in figure 4.

Before installing, magnetos which incorporate impulse couplings should be checked to see that the impulse coupling stop pin is inserted in the correct hole in the magneto mounting flange. The correct location of the pin depends on the angle at which the magneto is mounted on the engine as well as the direction of rotation of the magneto.

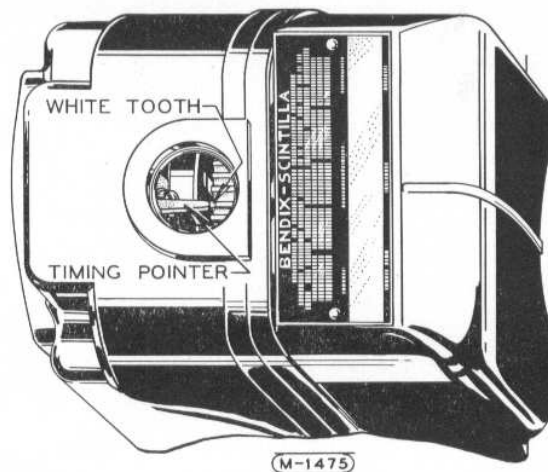


Fig. 3. Timing Marks Which Indicate No. 1 Firing
Position of Magneto

For purposes of identification the four holes in the magneto may be assigned numbers as shown in figure 5. Starting with the upper right hand hole, the holes are numbered from 1 to 4 in a clockwise direction.

For many of the mounting angles now in use, one stop pin will provide satisfactory performance of the impulse coupling. However, on installations having the magneto mounted with



Fig. 4. Depressing the Impulse Coupling Pawls

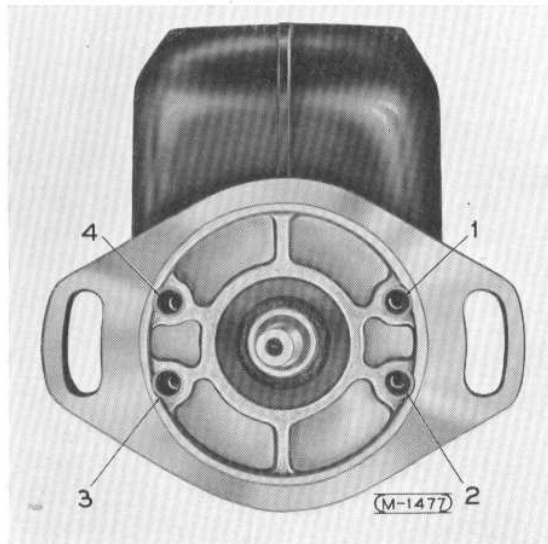


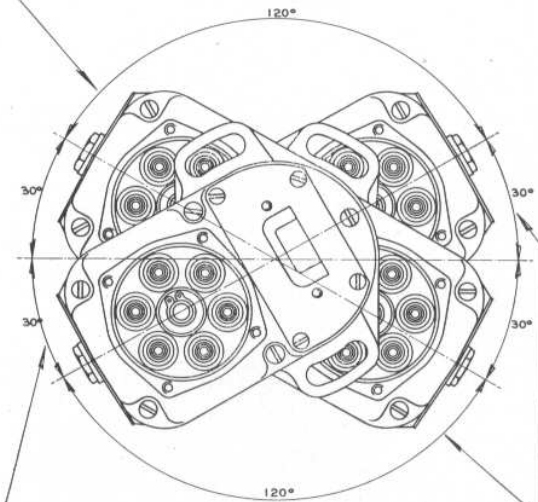
Fig. 5. Numbering of Stop Pin Holes in Flange

thirty degrees of its horizontal position, two pins are required in order to insure consistent performance at all desired speeds and at the same time achieve interchangeability of the left and right hand magnetos on engines having two magnetos symmetrically mounted.

Figure 6 is a chart showing the correct pin hole to use for mounting a magneto of either rotation at any angle on the engine. The determining factor is the angle between true vertical, and the centerline of the magneto when the latter is mounted on the engine and the engine is in the position it will normally assume when being started.

If necessary to change the location of the stop pin on a magneto for any reason, the pin can be pulled by the use of a steel bar, a standard 1/4-20 nut and a few plain washers. The

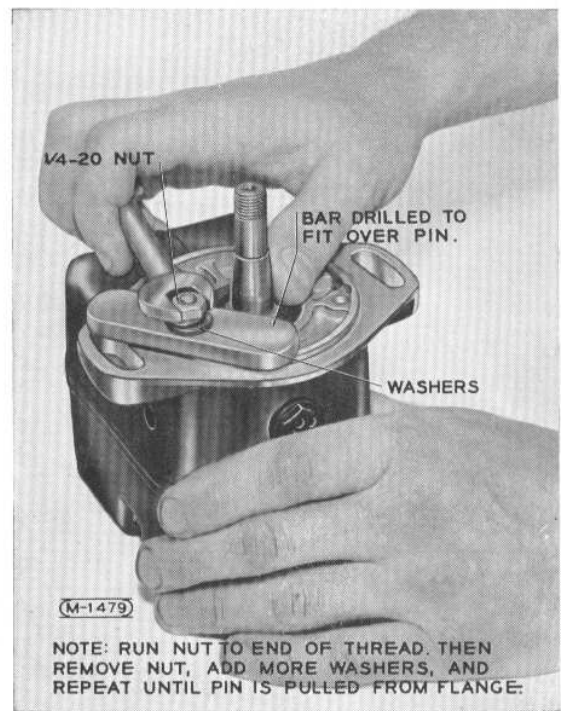
ONE STOP PIN IS USED ON MAGNETOS MOUNTED WITHIN THIS ANGLE.
FOR CLOCKWISE MAGNETOS PLACE PIN IN #2 HOLE,
FOR ANTI-CLOCKWISE MAGNETOS PLACE PIN IN #3 HOLE;



ONE STOP PIN IS USED ON MAGNETOS MOUNTED WITHIN THIS ANGLE. FOR CLOCKWISE MAGNETOS, PLACE PIN IN #4 HOLE. FOR ANTI-CLOCKWISE MAGNETOS, PLACE PIN IN #1 HOLE.

MAGNETOS MOUNTED WITHIN 30° OF HORIZONTAL POSITION REQUIRE 2 STOP PINS. FOR CLOCKWISE MAGNETOS, PLACE PINS IN HOLES 2 AND 4. FOR ANTI-CLOCKWISE MAGNETOS USE HOLES 1 AND 3. **M-1478**

Fig. 6. Chart of Stop Pin Holes and Corresponding Mounting Angles



NOTE: RUN NUT TO END OF THREAD. THEN REMOVE NUT, ADD MORE WASHERS, AND REPEAT UNTIL PIN IS PULLED FROM FLANGE.

Fig. 7. Pulling the Impulse Coupling Stop Pin

steel bar should be about 1/4 inch thick, an inch wide, and three inches long. In the center of the bar bore a hole large enough to fit over the stop pin. The pin is then pulled as shown in figure 7. The pin may be reinserted with an arbor press.

After checking the magneto and coupling, turn the engine to the full advance No. 1 cylinder firing position on the compression stroke as instructed in the engine handbook. Set the magneto at the position where the timing marks seen through the inspection hole line up as previously outlined. Install the magneto on the engine. Connect Scintilla No. 11-851 timing light, or equivalent, across the breaker points of the magneto and rotate the magneto through the angle provided by the elongated slots in the mounting flange until the timing light indicates that the points are just opening on the No. 1 cylinder. Secure the magneto in this position and recheck the adjustment.

Connect the ground wire to the ground terminal connection on the breaker housing. Earlier magnetos have the ground terminal connection located on the bottom of the housing. On some engines this location results in an interference against

manner. The high tension outlet marked "1" is to be connected to the No. 1 cylinder. (See figure 8.) The sparks are delivered to the various outlets in the same rotation as that of the magneto, i.e., to the right for a clockwise magneto; left for anti-clockwise. (See figure 9.)

Note: Later execution magnetos will be found to incorporate an engraved plate which provides information relative to the firing order of the magneto by means of numerals adjacent to the outlets.

When making the cable connections, first install the shielding ferrules over the cable in accordance with the engine manufacturer's instructions. For installations employing stainless steel conductors a slotted washer is used to secure the cable in position. To fasten this washer strip the end of the cable for a length of about a half inch. Insert the bared ends of the cable

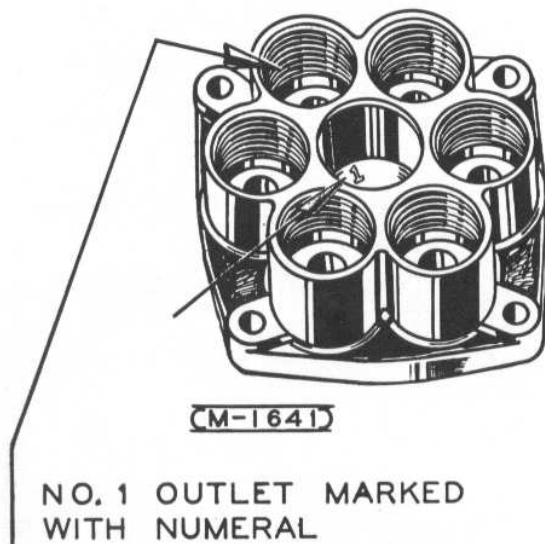


Fig. 8. Marking of No. 1 High Tension Outlet

an engine accessory, preventing insertion of the ground terminal insulating sleeve. To facilitate insertion of the sleeve on these installations, a special split sleeve is used, which can easily be inserted by pushing each of its two parts into position separately.

The high tension terminals are supplied in kit form, separate from the magneto. The cables are attached in the following

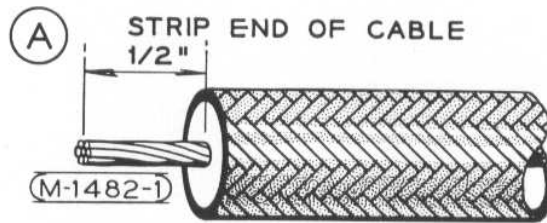


Fig. 10. Preparation of Cable

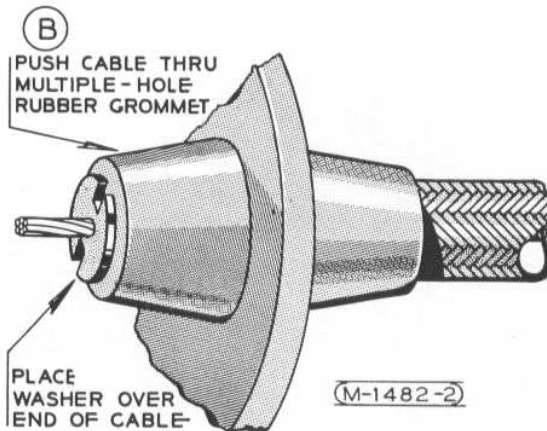


Fig. 11. Installing Cable to Grommet

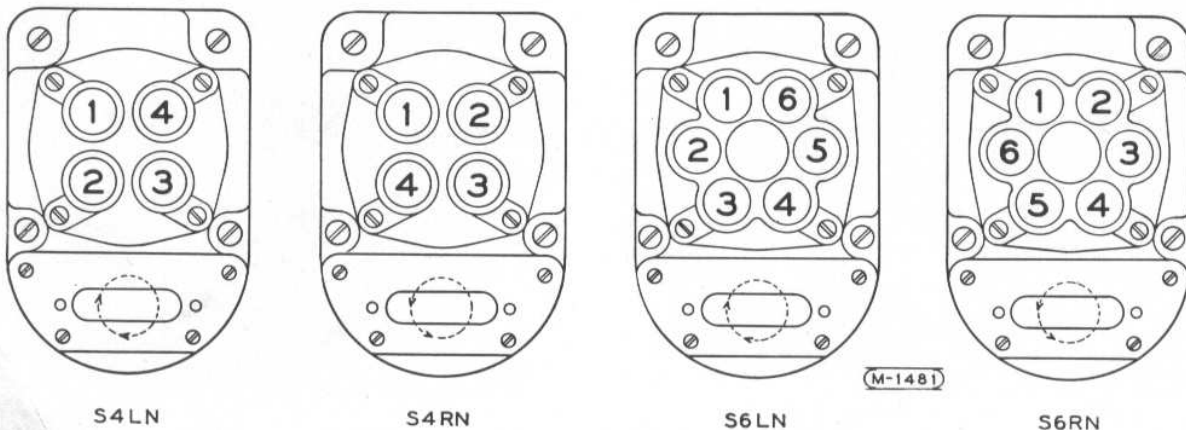
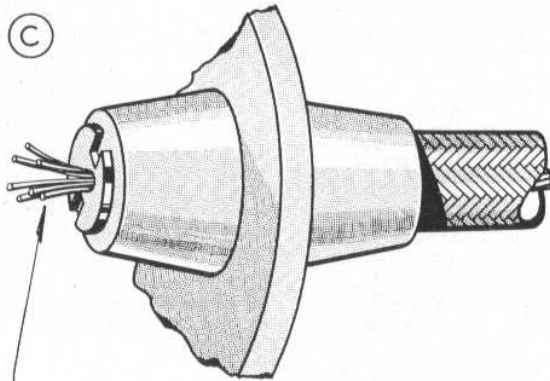


Fig. 9. Order of Firing of High Tension Outlets



STRAIGHTEN AND SEPARATE WIRE STRANDS INTO TWO APPROXIMATE EQUAL GROUPS. (M-1482-3)

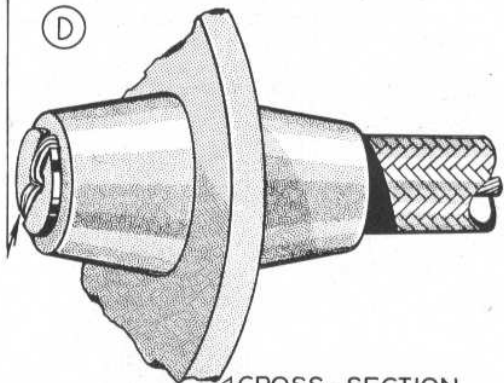
Fig. 12. Separating Wire Strands

strands through the hole in the rubber grommet and the contact washer; spread the ends of the strands over the face of the washer and bend them around its rim to secure in position. Then insert into the magneto and secure with the gland nut provided on the cable. (See figures 10 through 13.)

Copper conductor high tension cables may be secured to the rubber grommet with a cable piercing screw. To install the cables when using this type of connection, cut off the cable squarely and insert the squared end into the rubber grommet. Insert the cable piercing screw through the plain washer, the rubber grommet and into the conducting core of the cable. (See figure 14.) Tighten the screw moderately. The threaded end of the screw engages the cable conductor strands and forms a securely anchored connection.

Caution: Do not attempt to use cable piercing screws with stainless steel conductor cable. These screws are for use only with copper conductor cable.

WRAP WIRE STRANDS IN NOTCHES PROVIDED.



CROSS-SECTION VIEW OF WIRE STRANDS IN FINAL POSITION. (M-1482-4)



Fig. 13. Securing Strands to Washer

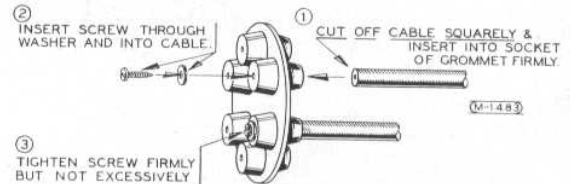


Fig. 14. Installation of Cable-Piercing Screw Used With Copper Conductor Cables

SECTION III

MAINTENANCE

Ordinarily these magnetos will not require any service or maintenance operations between engine overhaul periods. For this reason no periodic lubrication or inspection procedures are necessary in the course of normal operation.

If engine operating troubles develop which appear to be caused by the ignition system, it is advisable to check the spark plugs and wiring first, before opening the magnetos.

Should the trouble appear definitely associated with the magneto, the most effective measure is to install a replacement magneto which is known to be in satisfactory condition, and to turn over the suspected unit to the overhaul shop for repair and test.

Should this not be possible, a visual inspection may disclose the source of trouble. Remove the high tension outlet plate and take off the high tension cables and their rubber grommet. Inspect for the presence of moisture on the grommet, the cables and the high tension contact sockets in the distributor block within the magneto.

Should no moisture be found, remove the breaker cover and inspect the breaker. Turn the engine until the timing marks

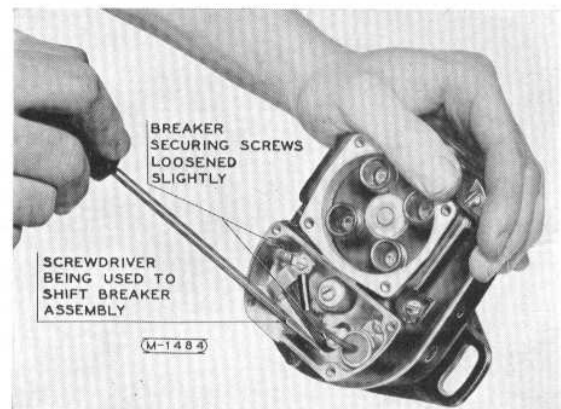


Fig. 15. Adjusting the Breaker Points

line up correctly. (See "Installation".) With the marks lined up, the breaker should be just starting to open. If the points do not break at this position, loosen the screw in the slotted hole of the breaker assembly and shift the breaker slightly so that the points just break contact when the marks line up as above. (See figure 15.)

If the breaker points are oily, they can be cleaned with a little clear gasoline. Avoid getting any gasoline on the breaker cam as the latter is impregnated with lubricant which would be washed away by gasoline or solvents.

If the breaker points are burned or worn excessively, remove

and test the condenser. (See sections on disassembly and test.) Do not try to redress the contact surfaces. If the points are in an unsatisfactory condition install a complete new breaker assembly.

Warning: Do not under any circumstances remove the five screws which hold the two sections of the magneto together, while the magneto is on the engine. To do so would disengage the distributor gears, causing the distributor timing to be "lost" and necessitating complete removal and retiming of the magneto.

SECTION IV

OVERHAUL PROCEDURE

Ordinarily it will be found expedient when changing magnetos to leave the ground terminal, nut and grommet, and the high tension outlet plate assembly on the engine. Therefore it is assumed that these parts have already been removed from the magneto before starting disassembly on the bench.

Remove the drive member and impulse coupling if used. (See section entitled "Impulse Couplings".) Take out the drive coupling key. If the magneto drive shaft is provided with an oil slinger, the latter must be removed with puller No. 11-1105.

Remove the breaker cover. Disconnect the primary lead and condenser lead from the breaker. Take out the condenser and the breaker assembly.

Important: The magnet material used in these magnetos is the well-known "ALNICO V", an alloy which has exceptional ability to retain its magnetism through the most severe service conditions. Owing to the high coercive force of this material, the MAGNET DOES NOT REQUIRE CHARGING and no attempt should be made to charge it when overhauling the magneto. Disregard of this precaution may result in an improperly charged magnet, which will adversely affect the performance of the magneto. Owing also to the fixed charge of the magnet, no primary current measurement is necessary in testing the assembled magneto.

Remove the carbon brush from the fiber distributor gear. Use No. 11-3071 special spreading tool to remove the lock ring from the distributor gear axle, after which the axle and gear can be pushed out. When using the No. 11-3071 tool, be sure that the stop on the tool is set correctly to prevent distortion of the lock ring by excessive spreading. The distributor block screws are now accessible so that the block can be removed. Some models incorporate a timing pointer which is secured under the top center block securing screw. Remove the plain washer and felt washer from the center section of the distributor block.

Remove the coil cable clamp and disconnect the coil ground wire from the magneto housing. Remove the two coil core clamps and lift the coil from the housing. This completes the disassembly of the magneto.

Cleaning

All parts of the magneto except the coil, condenser, distributor block, breaker, and breaker cam can be washed in kerosene or any standard solvent and dried with compressed air.

The distributor block and breaker cam must not be immersed in any solvent. This is because the cam and the bushing in the distributor block are sintered parts which are oil impregnated for lubrication purposes. Immersing these parts in a solvent would dissolve and wash away the lubricant. See separate paragraph in this section covering impregnation of these parts.

The coil and condenser may be cleaned if necessary by wiping with a cloth.

The breaker may be washed in clear unleaded gasoline and dried with compressed air, holding the points open slightly so that the solvent will be completely evaporated from the contact surfaces.

Inspection

If any part of a bearing is defective, the complete bearing must be replaced. If either of the inner races are removed from the shaft, be sure to keep the original shim washers (which were behind the race) in order and properly identified so that they can be used in reassembling.

The inner race of the breaker end bearing can be removed together with the small distributor gear by supporting the gear on two bars in an arbor press and pressing out the shaft. For the other races the following pullers will be required:

11-992 to remove outer race of drive end bearing.

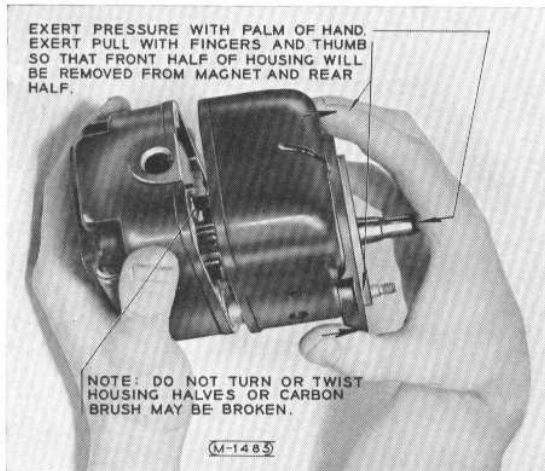


Fig. 16. Removing the Front Section of the Housing from Magnet and Rear Section

Remove the five screws which hold the two sections of the magneto together. Do not allow the two sections to turn in relation to each other. Hold the magneto as shown in figure 16 so pressure is exerted on the end of the drive shaft by the palm of the hand. Then with the thumb and fingers, pull the front section of the magneto straight away from the magnet and rear section, and lift off front section.

Remove the magnet from the rear section. On six cylinder magnetos the magnet must be tipped slightly to let the ball assembly clear the large distributor gear teeth as the magnet is lifted out. Remove the cam and the bearing ball assemblies from the magnet.

11-3065 to remove outer race of breaker end bearing.

11-1086 to remove inner race of drive end bearing.

It is recommended that the drive end oil seal and sleeve be replaced at every overhaul. The seal can be pushed out of the housing with a piece of hard wood dowel rod or bar stock about one inch in diameter. The bronze sleeve can be pulled by removing the inner race of the drive end bearing with No. 11-1086 puller.

Check both sections of the housing for cracks, stripped threads or loose inserts or bushings. See that the ventilator-drain holes in the plug in the bottom of the housing are open and clean.

Examine the high tension distributor electrode attached to the large gear. If excessive wear is evident, smooth off the

the cam follower is securely riveted to the main spring and that the screw which holds the parts of the breaker is tight. Examine the contact points for excessive wear or burning. Normal points will show a dull slightly rough contact surface. Points which have deep pits or excessively burned areas should be discarded. If any part of the breaker is defective the complete breaker assembly must be replaced.

Check the condenser with the No. 11-1767 condenser tester or equivalent. The capacity should be not less than .30 microfarads.

Impregnating Breaker Cam

The magneto breaker cam must be impregnated with oil before reassembling the magneto. To do this, place the cam in a small pan containing enough SAE No. 30 oil to completely cover the part. The oil should be heated to $200^{\circ} \pm 10^{\circ}$ F. Allow the cam to remain in the oil at this temperature for 15 minutes, then allow to cool to room temperature in the oil. After cooling wipe off excess oil with a clean cloth. The cam is then ready for use.

Impregnating Distributor Bushing and Wax-Treating Distributor Block

The bronze bushing in the distributor block must be impregnated with oil in order to provide proper lubrication for the distributor shaft which turns in this bushing. Ordinarily this would be accomplished in the same manner as prescribed above for the breaker cam, however owing to the requirement that a coating of special wax be applied to the distributor block, a slightly different procedure will be necessary.

A little care is necessary in performing the operations to follow since it is important that:

1. No wax compound be allowed to reach the bearing surface of the bronze bushing; and,
2. No oil be allowed to reach the dielectric surfaces of the distributor block.

To obtain satisfactory results, the following procedure should be employed:

1. Plug both ends of the sintered bronze bushing in the distributor block with tight-fitting corks.
2. Clean the dielectric surfaces of the distributor block thoroughly with lacquer thinner to remove all traces of oil and grease.
3. Dip the complete block in a solution made up of one part Scintilla No. 72 Wax Compound and five parts carbon tetrachloride.
4. After dipping, remove the cork from the side of the block which carries the distributor electrodes. Fill the bushing with SAE No. 30 oil. Then place the complete block in an oven at 200° F. for 45 minutes, with the open end of the bearing up. Be careful not to spill any oil over the waxed surfaces of the block.
5. Remove from oven and, keeping the open end of the bearing up, allow to cool to room temperature.
6. When part is cool, remove the remaining oil from the bearing and then remove the remaining cork. When doing this it is very important that no oil be allowed to fall on the waxed surfaces of the block.
7. If block is not to be assembled into the magneto immediately it should be wrapped in paper to prevent dust or chips from adhering to the waxed surfaces.

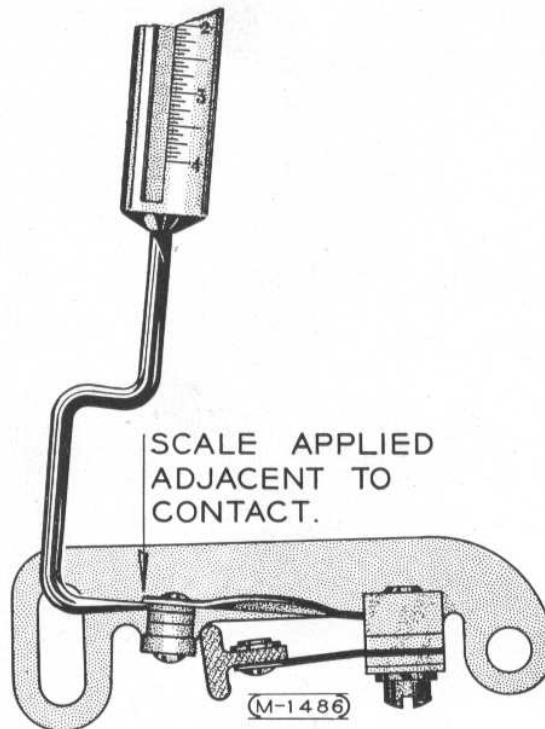


Fig. 17. Checking Breaker Main Spring Tension

electrode with a file. Try the distributor axle in its bushing in the distributor block. If excessive radial play can be felt, replace the complete distributor block. Check the distributor block for evidences of burning or carbon tracking. If the electrodes are worn down excessively replace the complete block. Bent or broken contact springs on the back of the block can be removed with a pair of thin-nosed pliers.

Check the main spring of the breaker assembly for proper tension as shown in figure 17. The tension must be between 16 and 20 ounces at the instant the breaker opens. See that

SECTION V

REASSEMBLY

On four-cylinder magnetos the small distributor gear must be installed so that the arrows on the gear point in the direction in which the magnet turns. (See figure 18.) Six-cylinder magnetos must have the gear installed with the chamfer of the timing tooth toward the drive end of the shaft.

If any of the ball bearing races were for any reason removed from the housing or magnet, check the bearing adjustment. Press the bearing races into position using the original shim washers behind the inside races. Assemble the magnet into

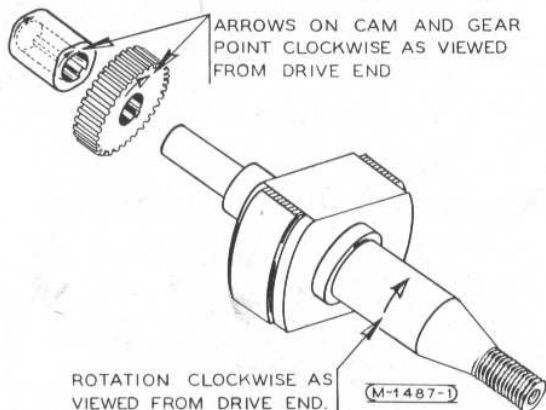


Fig. 18A. Correct Assembly of Cam and Gear to Magnet—Clockwise

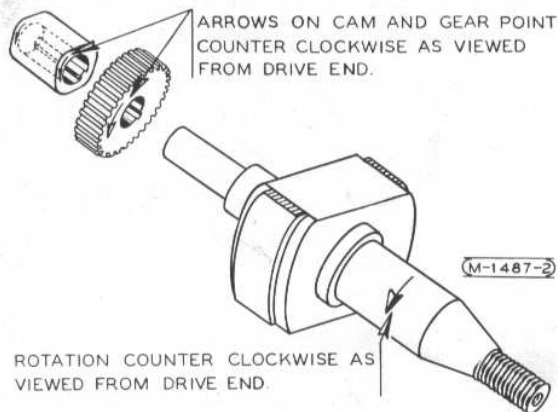


Fig. 18B. Correct Assembly of Cam and Gear to Magnet—Anticlockwise

the two sections of the housing having all bearing parts in position. Check to see that the magnet turns freely and has no perceptible end play. If the bearings are too tight, remove shim washers, or if too loose, add shim washers, until free turning with no end play is obtained.

Note: In making the above check either the oil seal or the bronze seal sleeve should be omitted from the magneto so that the drag of the oil seal will not interfere with the free operation of the bearings.

A little care is necessary in pressing the bronze sleeve on the shaft. The sleeve must be started straight and pressed on with a tool which has been accurately squared on the end. A little oil on the shaft will help prevent damage to the sleeve. After installing the sleeve coat it lightly with Andok "C" grease. Also coat the inner surface of the oil seal with the same grease.

Install the contact springs into the distributor block, if removed. This can be done with a piece of hard wood dowel rod shaped to fit within the small diameter end of the spring. The spring is then placed over the end of the dowel and pushed into its socket, turning it to the left until it snaps into its groove in the recess.

Before installing the distributor block to the magneto, the distributor electrode clearance must be visually checked with the gear partially inserted in the block. This clearance can be observed and estimated with the eye by looking between the gear and the block. The clearance should be approximately ten to thirty thousandths (.010" to .030"). Correct clearance can be obtained by bending the electrode on the gear slightly. After making this check, do not interchange the gear or block with parts from another magneto, as this might result in improper clearances at final assembly.

Saturate the felt washer of the distributor block with SAE No. 30 oil and place it in position. Secure the block in the magneto. If a separate timing pointer is used it must be installed under the top center securing screw of the distributor block. Place the distributor gear in position. Place the plain washer in position and install the lock ring. Install the carbon brush.

Before installing the breaker, apply three drops of a good grade SAE No. 60 engine oil to the felt pad which is attached to the cam follower. Allow about fifteen minutes for the oil to penetrate into the felt. Then blot off any excess of oil with a cloth. Avoid getting any oil on the contact point surfaces.

Install the condenser and breaker. To allow for insertion of the cam without damage, the breaker should be set back as far against the wall of the compartment as the slotted hole will permit.

Install the oil seal by pressing it into position with a piece of 1-3/8 inch diameter round stock which has been squared on the ends. Install the coil and connect the ground lead. Secure the primary lead with its clamp. Fit the primary lead into its passage in the housing. (See figure 19.)

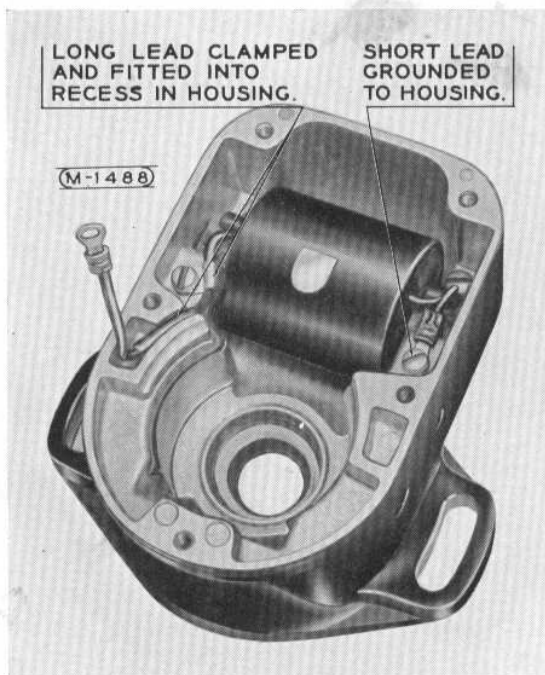


Fig. 19. Correct Positioning of Coil Leads in Housing

Pack the ball bearings with Andok "C" grease and place the ball assemblies in position on the magnet shaft. Apply a light coating of Andok "C" grease also to the teeth of both distributor gears.

The cam must be installed so that the arrows point in the direction of magnet rotation. Be sure the cam is installed correctly. (See figure 18.)

Engage the rotating magnet into the rear section of the housing having the chamfered tooth on the small gear meshed with the dot "L" for left hand rotation magnetos (S4LN and S6LN) or the dot "R" for right hand rotation (S4RN and S6RN). (See figure 20.)

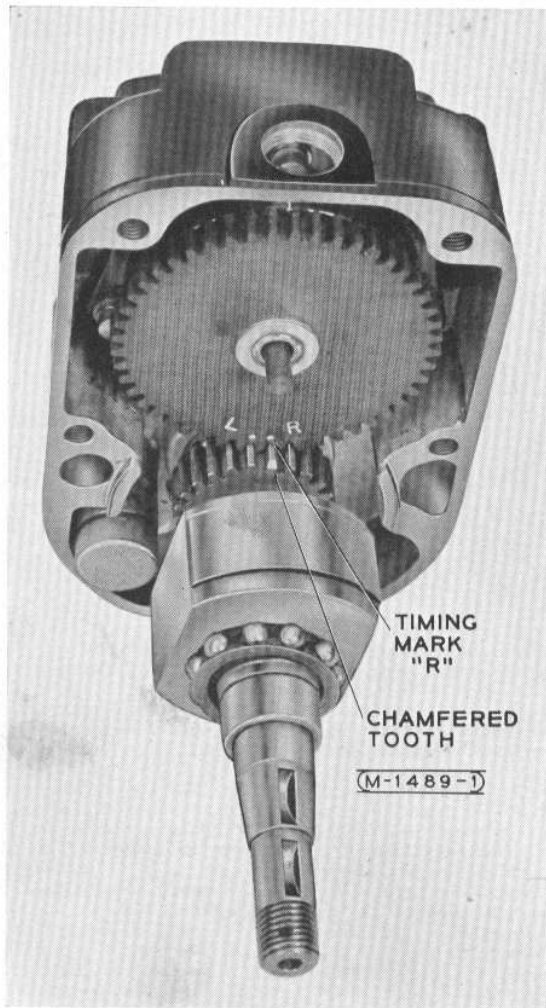


Fig. 20A. Correct Meshing of Distributor Gears—Clockwise Magneto

Straighten out the primary lead so that it can be threaded through the passage in the rear section of the housing when assembling the housing halves. Engage the two halves of the housing, at the same time threading the primary lead through its passageway into the breaker. (See figure 21.) Be careful to push the housing sections straight together. Twisting or turning

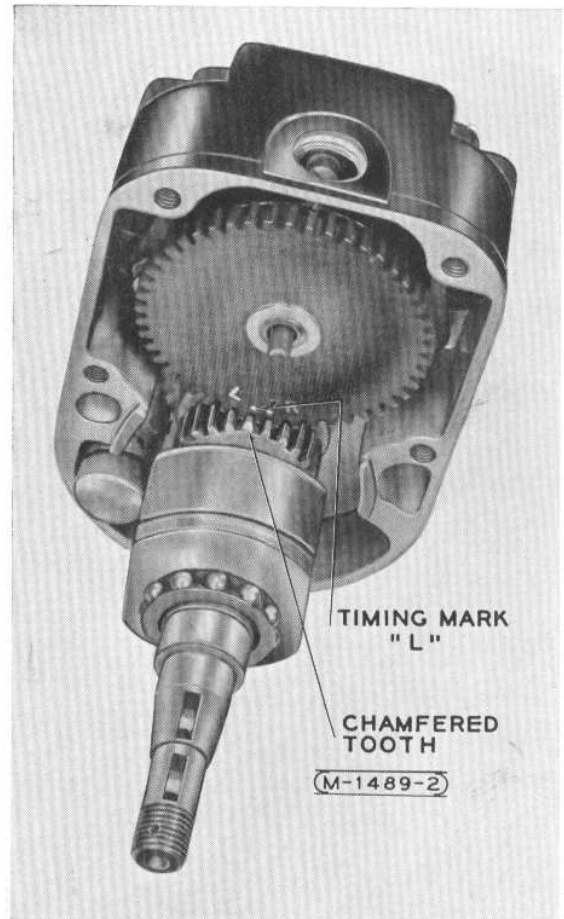


Fig. 20B. Correct Meshing of Distributor Gears—Anticlockwise Magneto

either section may break the carbon brush in the distributor. Secure the housing halves with the five screws.

Connect the coil primary lead and the condenser lead to the breaker as shown in figure 22 to avoid cramping of the lead terminals against the housing. Newer execution magnetos, having the ground terminal on the breaker cover, employ a separate breaker grounding spring which must be assembled to the breaker at the same time the leads are connected. (See figure 24.)

If the magneto incorporates a timing pointer instead of a timing mark on the distributor block, it may be necessary to adjust the timing pointer when reassembling the magneto.

To set the timing pointer correctly, scribe two marks $17/64$ " apart on the 3-inch diameter section of the mounting flange pilot of the magneto. (See figure 23.) These marks may be in any location around the pilot. Turn the magneto in its operating direction until the white tooth of the large gear approximately lines up with the timing pointer, and then turn back a few degrees until the magnet locates in its neutral position. This can be felt as the shaft is turned, the magnet having a tendency to locate positively in neutral and remain there.

With the magnet located in its neutral position, wrap a piece of soft wire around the drive shaft tightly enough so it will turn with the magnet and serve as a temporary pointer. (See figure 23.) Bend the end of the wire to index with one of the marks previously scribed on the flange, using the correct mark for the particular rotation of the magneto so that when the magnet is turned in its normal rotation the wire pointer will move from the first mark toward the second mark. The $17/64$ " distance measured on the 3" diameter of the pilot, corresponds to 10° of magnet rotation. The correct "E" gap for this magneto is $10^\circ \pm 4^\circ$.

Starting with the magnet in neutral and the wire pointer

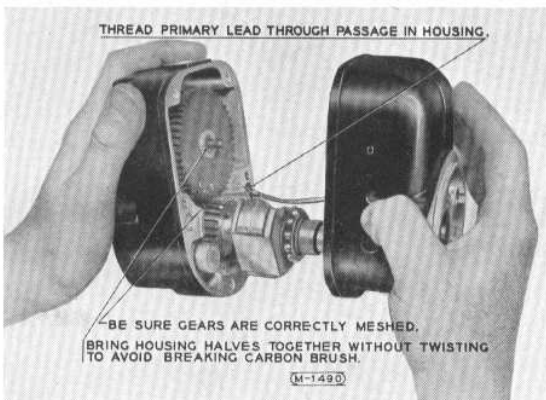


Fig. 21. Engaging the Two Halves of the Housing

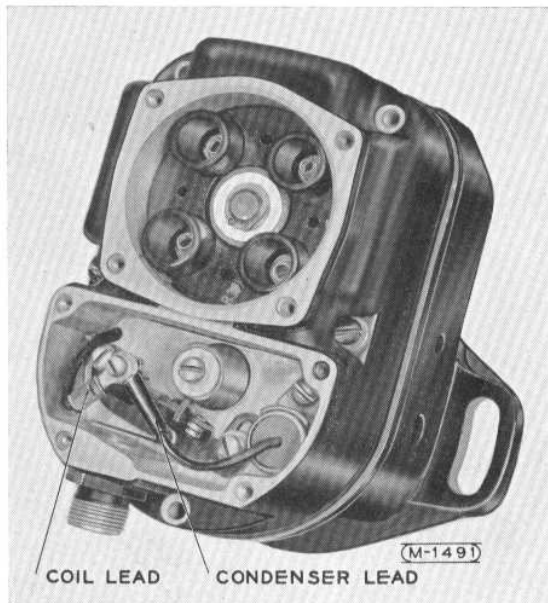


Fig. 22. Correct Assembly of Lead Assembly to Breaker

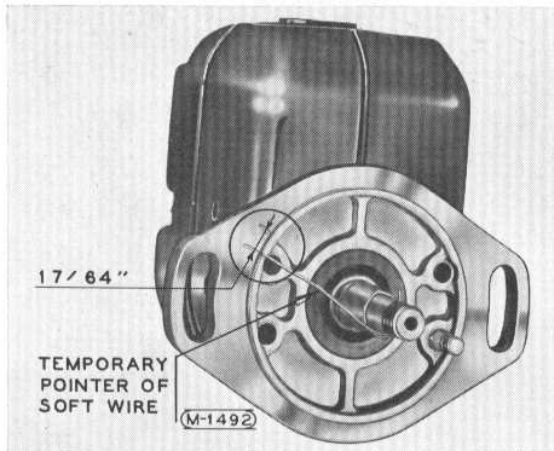


Fig. 23. Temporary Pointer and Timing Marks Used to Set "E" Gap



Fig. 24. Positioning of Safety Ground Spring on Breaker

indexed over the first mark, turn the magnet until the wire pointer lines up with the second mark. The magnet is now at its exact "E" gap position at 10° past neutral. At this position the timing pointer inside the magneto should line up with the white tooth on the large gear. It will perhaps be necessary to readjust the timing pointer slightly in order to have it line up with the white tooth of the gear. If so, this can be done with a pair of slim-nosed pliers. When the timing pointer has been set correctly it can be used as a reference for locating the position at which the contact points must open, and the breaker can be adjusted in the regular manner to have the points open at this position.

Turn the magnet until the timing marks seen through the inspection window line up, and adjust the contact points so that they are just opening at this position. (See "Installation".)

Check the ground terminal contact spring on the breaker. When no ground terminal is installed, the terminal contact spring should bear firmly against the housing of the magneto. If it does not, take out the breaker and bend the spring slightly. If the new type separate grounding spring is used, the spring can be removed from the breaker to make this adjustment. (See figure 24.)

After testing the magneto install the breaker cover, high tension outlet plate, drive shaft oil slinger if used, and the drive member or impulse coupling. The oil slinger must be pressed on before installing the breaker cover, as the cam end of the shaft must be supported when pressing on the oil slinger.

SECTION VI

IMPULSE COUPLINGS

The type IC-H impulse couplings used on these magnetos are simple in design and consist of only three major parts; the body, the spring, and the cam assembly. A stop pin in the magneto flange is employed to engage and actuate the coupling.

The impulse coupling is entirely automatic in operation and requires no maintenance between magneto overhauls.

At the time of overhauling the magneto, the coupling should be cleaned and inspected for wear; and any necessary replacements should be made.

To remove the coupling from the magneto a puller will be required. Some standard gear pullers having thin jaws can be used for this purpose, or the No. 11-1037 puller can be used. Be sure the puller is engaged behind the cam assembly of the coupling as shown in figure 25 when pulling the coupling.

To disassemble the coupling, clamp the body between the padded jaws of a vise, having the flyweights turned out. The drive end of the magnet can then be inserted into the hole in the coupling so that the magnet key engages the coupling keyway. The magnet can then be used as a handle to turn the cam assembly against the tension of the coupling spring enough to lift the flyweights clear of the projections on the body. The spring can then be released slowly and taken out. Clean and inspect the coupling parts and replace any which show appreciable wear, giving particular attention to the flyweights. If the flyweight rivets are loose in the cam plate, or the flyweights have excessive play on the rivets, the complete cam assembly should be replaced.

When reassembling the coupling the reverse procedure should be employed. The coupling spring should be coated lightly with a good grade of oil before putting it into position.



Fig. 25. Application of Puller to Impulse Coupling

SECTION VII

MAGNETO TEST PROCEDURE

Mount the magneto on the No. 11-700 test stand, using the No. 11-3089 angle plate assembly and the No. 11-3092 pulley assembly. Connect the high tension outlets to the spark gaps on the test stand using a standard high tension outlet assembly. The spark gaps must be set at 5 mm. as per figure 26.

ADJUST POINTS AS SHOWN BELOW

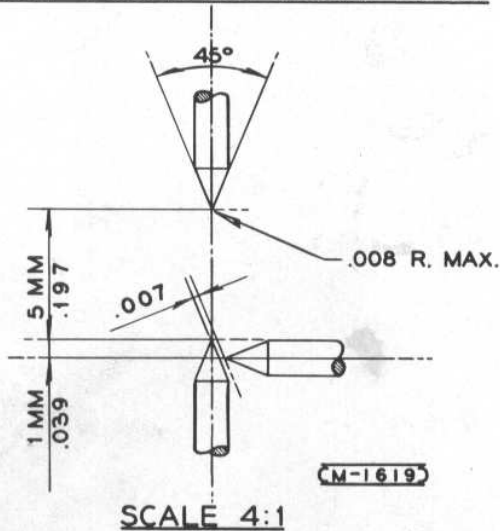


Fig. 26. Correct Setting of 5 M.M. Test Gap

Spin the drive pulley over a few times by hand to make sure the magneto turns freely.

Insert a piece of heavy paper or cardboard between the breaker grounding contact spring and the magneto housing. (See figure 27.)

Operate the magneto for several minutes at various speeds to observe mechanical and electrical performance.

Determine the lowest speed that the magneto can be turned and still spark all gaps without missing (coming-in speed). The magneto should spark consistently at 250 R.P.M. If the coming-in speed is above 250 R.P.M., the trouble may be due

to dirty contact points, weak coil, defective condenser, excessive distributor clearance, or improperly adjusted breaker contacts. Clean the breaker, try a new coil and condenser, recheck the electrode clearance and breaker adjustment and repeat test.



Fig. 27. Paper Insulating Strip Under Breaker Grounding Spring

Important: The magnet material used in these magnetos is the well-known "ALNICO V", an alloy which has exceptional ability to retain its magnetism through the most severe service conditions. Owing to the high coercive force of this material, the MAGNET DOES NOT REQUIRE CHARGING and no attempt should be made to charge it when overhauling the magneto. Disregard of this precaution may result in an improperly charged magnet, which will adversely affect the performance of the magneto. Owing also to the fixed charge of the magnet, no primary current measurement is necessary in testing the assembled magneto.

Operate magneto at 4000 R.P.M. for a few minutes. Open the spark gaps to 7 mm. momentarily and observe sparks. If missing occurs, repeat test with a new coil.

Warning: Do not forget to remove the paper or cardboard strip from under the breaker grounding spring after completing the test of the magneto. If the paper strip is left in the magneto, it would be impossible to turn the ignition off, leaving the magneto always on "Contact" and creating a hazard to any persons working on the engine.

SERVICE TOOLS REQUIRED

11-700	Test Stand	For running test of magneto.
11-992	Puller	To remove outer race of drive end bearings.
11-1037	Puller	To remove impulse coupling.
11-1086	Puller	For inner race of drive end bearing.
11-1105	Puller	To remove oil slinger.
11-1767	Condenser Tester	To test condensers.
11-3065	Puller	To remove outer race of breaker end bearing.

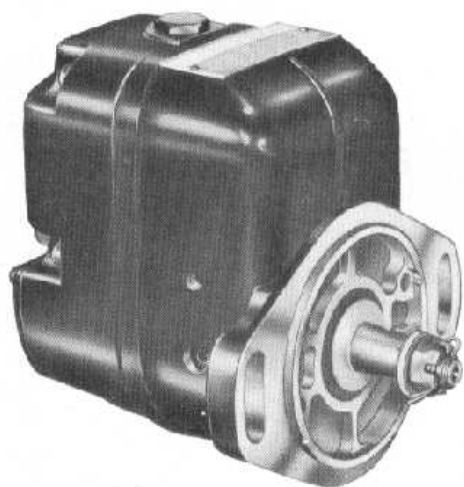
11-3071	Special Pliers*	To remove distributor axle retaining ring.
†11-3089	Angle Plate Assembly	For mounting magneto on test stand.

*The special pliers may be obtained from TRU-ARC Division, WALDES KOHINOOR INC. Long Island City, N. Y., by ordering Waldes TRU-ARC Retaining Ring Pliers, No. 2.
 †NOTE: If No. 11-708 Drive Assembly is already available the No. 11-3089 Angle Plate Assembly is not required.

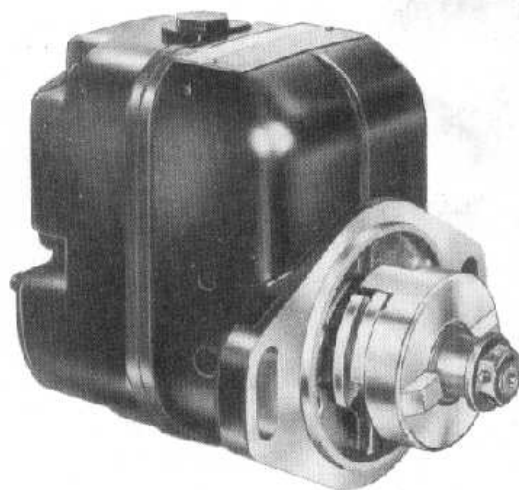
SERVICE PARTS LIST

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

TYPES S4R(L)N-20, S4R(L)N-21



S4N-20



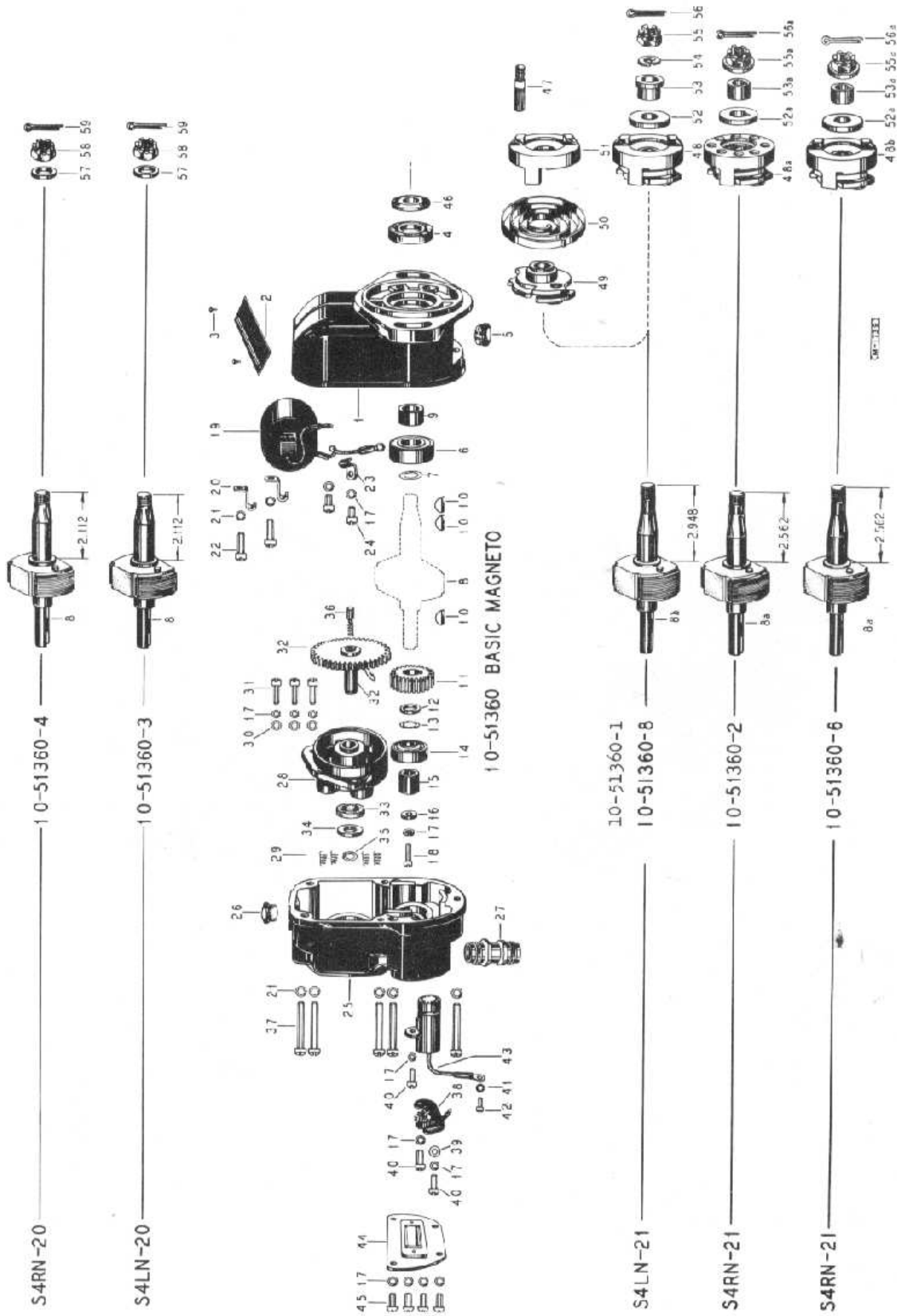
S4N-21



SCINTILLA MAGNETO DIVISION

BENDIX AVIATION CORPORATION

SIDNEY, NEW YORK, U. S. A.



COMPONENT PARTS OF BASIC ASSEMBLY AND VARIOUS INSTALLATIONS OF S4 MAGNETO

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

Replacement Ignition Assemblies may be obtained in kit form for Continental and Lycoming four cylinder engines. The following data is provided for reference purposes.

ENGINE APPLICATIONS

Engine		Magneto Type	Magneto Replacement Kit No.	Units Per Engine
Make	Model			
Continental	*A-65-8	S4RN-20	10-53550-4 Right Side of Engine	1
		S4RN-21	10-53550-6 Left Side of Engine	1
Continental	C-75-12F C-85-12F	S4LN-21	10-53550-1	2
Lycoming	0145-B2 -B3 0145-C2 -C3	S4LN-20	10-53550-3 Right Side of Engine	1
	0235 C 0290 A	S4LN-21	10-53550-8 Left Side of Engine	1

*When replacing Case magnetos on the A-65-8 engine a new magneto drive gear No. 36067 must be obtained from Continental Motors Corporation, Muskegon, Michigan, or their local dealer. This is necessary to provide for installation of the S4RN-21 magneto to the left side of the engine, as the Case magneto which it replaces has the drive gear riveted to the magneto impulse coupling, and removal of the gear is impractical.

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

COMPONENTS OF COMPLETE MAGNETO KITS

(Complete Magneto Kits consist of a basic magneto, a high tension terminal kit and a ground terminal kit, as shown below.)

Magneto Kit Part No.	Magneto Type	Magneto Part No.	High Tension Kit Part No.	Ground Terminal Kit No.
10-53550-1	S4LN-21	10-51360-1	10-52935	10-52305-1
10-53550-3	S4LN-20	10-51360-3	10-52935	10-52305-1
10-53550-4	S4RN-20	10-51360-4	10-52935	10-52305-1
10-53550-6	S4RN-21	10-51360-6	10-52935	10-52305-1
10-53550-8	S4LN-21	10-51360-8	10-52935	10-52305-1

RADIO SHIELDING

These magnetos as supplied are adaptable for either shielded or unshielded operation. When used on shielded installations ferrules and nuts must be obtained from the engine manufacturers or their local dealers to adapt the shielded spark plug cables to the magneto. The engine manufacturers' parts required for each shielded spark plug cable are listed below:

Engine Manufacturers' Parts Required
 for Shielded Magneto Installations

Engines Manufactured By	Engine Manufacturers' Parts Required
Continental Motors Corporation Muskegon, Michigan	Nut No. 25302, Ferrule No. 20087 One each required per Cable
Lycoming Division, AVCO Corp. Williamsport, Pennsylvania	Nut No. 61563, Ferrule No. 61558 One each required per Cable
Aircooled Motors, Inc, (Franklin) Syracuse, New York	Aircooled does not furnish. Use parts supplied by Continental or Lycoming.

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

PARTS COMMON TO S4N BASIC ASSEMBLY 10-51360

Ref. No.	Part No.	No. Req.	Description
1	10-52941	1	HOUSING - Magneto
2	2-782Z	1	PLATE - Magneto Identification
3	10-22067	2	DRIVE SCREW (Identification Plate)
4	10-27448	1	OIL SEAL - Drive Shaft
5	10-50732	1	VENTILATOR - Magneto Housing
6	10-3057	1	BEARING - Ball (Magnet, Drive End)
7	2-161-1		WASHER - Shim - .0025" thick
	2-161-2		WASHER - Shim - .004" thick
	2-161-3		WASHER - Shim - .005" thick
	2-161-4		WASHER - Shim - .008" thick
	2-161-5		WASHER - Shim - .010" thick
	2-161-6		WASHER - Shim - .012" thick (Drive End Bearing)
8	**	1	MAGNET - Rotating
9	10-25788	1	BUSHING - Drive Shaft
10	2-295Z	3	KEY - Woodruff (1, Small Distributor Gear) (1, Impulse Coupling) (1, Impulse Coupling Bushing)
11	10-50754	1	GEAR - Distributor - Small
12	10-3503	1	SPACER - Plain (Breaker End Bearing)
13	2-199-1		WASHER - Shim - .0025" thick
	2-199-2		WASHER - Shim - .004" thick
	2-199-3		WASHER - Shim - .005" thick
	2-199-4		WASHER - Shim - .008" thick
	2-199-5		WASHER - Shim - .010" thick
	2-199-6		WASHER - Shim - .012" thick (Breaker End Bearing)
14	2-202	1	BEARING - Ball (Magnet, Breaker End)
15	10-52951	1	CAM - Breaker
16	10-51354	1	WASHER - Plain (Cam Screw)
17	10-7501	13	WASHER - Lock (1, Cam Screw) (1, Primary Lead Clip Screw) (1, Primary Lead Terminal Screw) (3, Distributor Block Screw) (2, Breaker Assembly Securing Screw) (1, Condenser Retaining Screw) (4, Breaker Cover Screw)
18	10-16483	1	SCREW (Cam)
19	10-51303	1	COIL
20	10-50765	2	CLAMP - Coil Core
21	10-3132	7	WASHER - Lock (2, Coil Core Clamp Screw) (5, Distributor Housing to Magneto Housing Screw)

** See Section PARTS SPECIAL FOR MAGNETO INSTALLATIONS

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

Ref. No.	Part No.	No. Req.	Description
22	10-16486	2	SCREW (Coil Core Clamp)
23	10-5752	1	CLIP - Primary Lead
24	10-16479	2	SCREW (1, Primary Lead Clip) (1, Primary Lead Terminal)
25	10-52942	1	HOUSING - Distributor
26	10-51391	1	PLUG - Distributor Housing
27	10-51612	1	BUSHING - Ground Terminal
28	10-52949	1	BLOCK - Distributor
29	10-50737	4	SPRING (H.T. Cable Contact)
30	10-7611	3	WASHER - Plain (Distributor Block Screw)
31	10-50775	3	SCREW (Distributor Block)
32	10-50746	1	GEAR - Distributor - Large
33	10-50752	1	WASHER - Felt (Distributor Gear Axle)
34	10-50753	1	WASHER - Plain (Distributor Gear Axle)
35	10-31282	1	RING - Retaining (Distributor Gear)
36	10-9595	1	BRUSH - Carbon
37	10-21344	5	SCREW (Distributor Housing to Magneto Housing)
38	10-52952	1	BREAKER ASSEMBLY
39	10-14268	1	WASHER - Plain (Breaker Assembly Securing Screw, Adjusting End)
40	10-16481	3	SCREW (2, Breaker Assembly Securing) (1, Condenser Retaining)
41	2-194	1	WASHER - Lock (Lead to Breaker Screw)
42	10-51355	1	SCREW (Lead to Breaker)
43	10-51676	1	CONDENSER
44	10-52937	1	COVER - Breaker
45	10-16504	4	SCREW (Breaker Cover)
46	10-51678	1	OIL SLINGER (Drive Shaft)

Notes: S4N-20, S4N-21 magnetos are not equipped with high tension terminals (For details of kit 10-52935 see page 3F-132) or ground terminals (For details of assembly see page 3F-133) when they leave the factory. These assemblies are furnished separately.

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

Page 3F-131A
Rev. Oct. 1947

Note: The following is a listing of the parts required, for use with basic magneto 10-51360, to complete the various installations. The magneto is furnished as a unit conforming to the installation specification.

PARTS SPECIAL FOR S4N-20 MAGNETO INSTALLATIONS

Ref. No.	Part No.	No. Req.	Description
TYPE S4LN-20			
Instal. No. 10-51360-3			
8	10-52945	1	MAGNET - Rotating
57	10-4093	1	WASHER - Plain (Drive Shaft Nut)
58	10-4092	1	NUT - Drive Shaft
59	2-393	1	PIN - Cotter (Drive Shaft Nut)

Ref. No.	Part No.	No. Req.	Description
TYPE S4RN-20			
Instal. No. 10-51360-4			
8	10-52945	1	MAGNET - Rotating
57	10-4093	1	WASHER - Plain (Drive Shaft Nut)
58	10-4092	1	NUT - Drive Shaft
59	2-393	1	PIN - Cotter (Drive Shaft Nut)

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

PARTS SPECIAL FOR S4N-21 MAGNETO INSTALLATIONS

Ref. No.	Part No.	No. Req.	Description
TYPE S4LN-21			
Instal. No. 10-51360-1			
8b	10-52947	1	MAGNET - Rotating
47	10-51390	1	PIN - Stop (Impulse Coupling)
48	10-51362	1	IMPULSE COUPLING - Type IC-H - 25° Lag
49	10-51335	1	CAM - Impulse Coupling
50	10-51324	1	SPRING - Main (Impulse Coupling)
51	10-51332	1	BODY - Impulse Coupling
52	10-51370	1	WASHER - Plain (Impulse Coupling)
53	10-51659	1	BUSHING - Shouldered (Impulse Coupling)
54	10-3793	1	WASHER - Lock (Drive Shaft Nut)
55	10-51643	1	NUT - Drive Shaft
56	2-393	1	PIN - Cotter (Drive Shaft Nut)

Ref No.	Part No.	No. Req.	Description
TYPE S4RN-21			
Instal. No. 10-51360-2			
8a	10-52946	1	MAGNET - Rotating
47	10-51390	1	PIN - Stop (Impulse Coupling)
48a	10-52316	1	IMPULSE COUPLING - Type IC-H - 25° Lag
49	10-51323	1	CAM - Impulse Coupling
50	10-51324	1	SPRING - Main (Impulse Coupling)
51	10-51395	1	BODY - Impulse Coupling
52a	10-51613	1	WASHER - Keyed (Impulse Coupling)
53a	10-51651	1	BUSHING - Impulse Coupling
55a	10-51652	1	NUT - Drive Shaft
56a	10-51644	1	PIN - Cotter (Drive Shaft Nut)

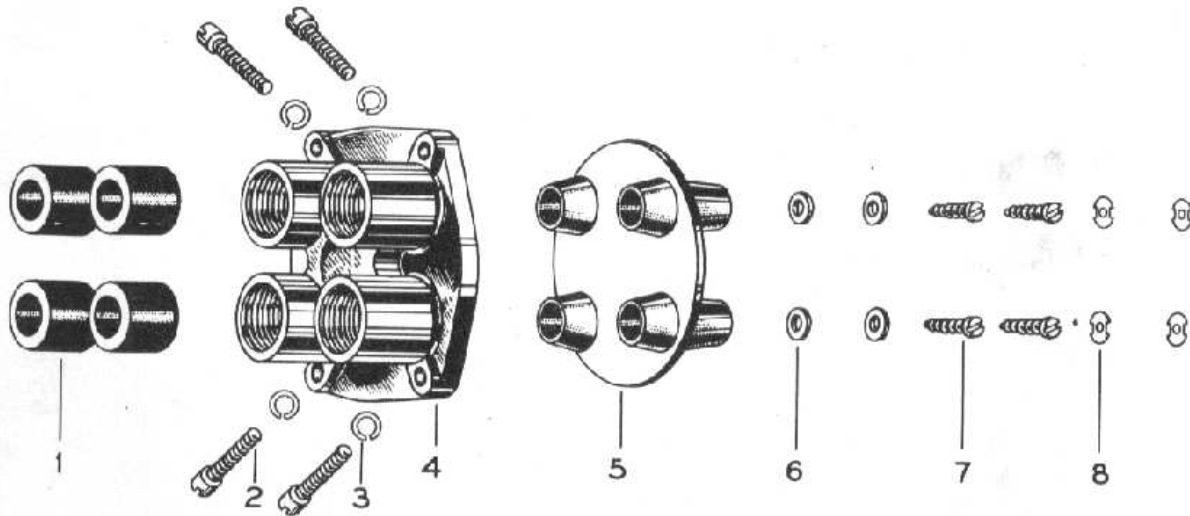
BENDIX-SCINTILLA AIRCRAFT MAGNETOS

PARTS SPECIAL FOR S4N-21 MAGNETO INSTALLATIONS

Ref. No.	Part No.	No. Req.	Description
TYPE S4RN-21			
Install. No. 10-51360-6			
8a	10-52946	1	MAGNET - Rotating
47	10-51390	1	PIN - Stop (Impulse Coupling)
48b	10-51361	1	IMPULSE COUPLING - Type IC-H - 25° Lag
49	10-51323	1	CAM - Impulse Coupling
50	10-51324	1	SPRING - Main (Impulse Coupling)
51	10-51333	1	BODY - Impulse Coupling
52a	10-51613	1	WASHER - Plain (Impulse Coupling)
53a	10-51651	1	BUSHING - Shouldered (Impulse Coupling)
55a	10-51652	1	NUT - Drive Shaft
56a	10-51644	1	PIN - Cotter (Drive Shaft Nut)

Ref. No.	Part No.	No. Req.	Description
TYPE S4LN-21			
Install. No. 10-51360-8			
8b	10-52947	1	MAGNET - Rotating
47	10-51390	2	PIN - Stop (Impulse Coupling)
48	10-51362	1	IMPULSE COUPLING - Type IC-H - 25° Lag
49	10-51335	1	CAM - Impulse Coupling
50	10-51324	1	SPRING - Main (Impulse Coupling)
51	10-51332	1	BODY - Impulse Coupling
52	10-51370	1	WASHER - Plain (Impulse Coupling)
53	10-51659	1	BUSHING - Shouldered (Impulse Coupling)
54	10-3793	1	WASHER - Lock (Drive Shaft Nut)
55	10-51643	1	NUT - Drive Shaft
56	2-393	1	PIN - Cotter (Drive Shaft Nut)

BENDIX-SCINTILLA AIRCRAFT MAGNETOS



HIGH TENSION CABLE OUTLET ASSEMBLY

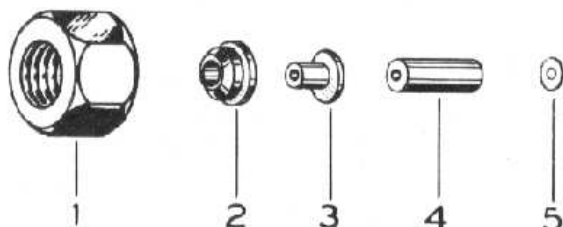
Kit No. 10-52935

Ref. No.	Part No.	No. Req.	Description
1	10-52934	4	GROMMET (Cable Protection) (Used non-shielded installations)
2	10-16487	4	SCREW (Cable Outlet Plate)
3	10-3132	4	WASHER - Lock (Cable Outlet Plate Screw)
4	10-50766	1	PLATE - Cable Outlet (Threaded Outlets)
5	10-50739	1	GROMMET - Cable Outlet
6	10-8785	4	WASHER - Plain (H.T. Cable Screw) (Used only with Copper Conductor Cable)
7	10-14215	4	SCREW (H.T. Cable Outlet) (Used only with Copper Conductor Cable)
8	10-51677	4	WASHER - H.T. Cable Contact (Used only with Stainless Steel Conductor Cable)

BENDIX-SCINTILLA AIRCRAFT MAGNETOS

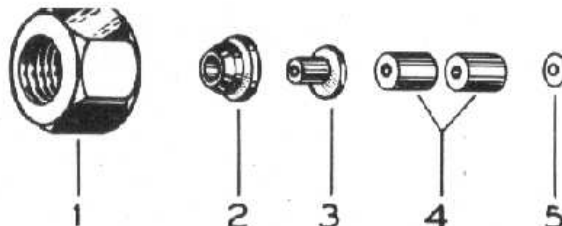
SCINTILLA GROUND TERMINAL ASSEMBLY

Used on: S4N-20 Magnetos, Install. No. 10-51360-3
S4N-21 Magnetos, Install. Nos. 10-51360-1, -2



Kit No. 10-52305

Ref. No.	Part No.	No. Req.	Description
1	10-37669	1	NUT - Coupling (Ground Terminal)
2	10-7030	1	FERRULE - Outer (Ground Wire)
3	10-7029	1	FERRULE - Inner (Ground Wire)
4	10-37668	1	SLEEVE - Insulating (Ground Wire)
5	2-155	1	WASHER - Ground Wire Contact



Kit No. 10-52305-1

Ref. No.	Part No.	No. Req.	Description
1	10-37669	1	NUT - Coupling (Ground Terminal)
2	10-7030	1	FERRULE - Outer (Ground Wire)
3	10-7029	1	FERRULE - Inner (Ground Wire)
4	10-52901	1	SLEEVE - Insulating (Ground Wire)
5	2-155	1	WASHER - Ground Wire Contact