

EO 15-5BC-2

EO 15-5BC-2

ROYAL CANADIAN AIR FORCE



HANDBOOK WITH PART LIST

STARTING VIBRATORS TYPES B3 AND B5

BOSCH

This EO Replaces Interim Publication

ISSUED ON AUTHORITY OF THE CHIEF OF THE AIR STAFF

LIST OF RCAF REVISIONS

Date	Page No	Date	Page No
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FOREWORD

Every effort has been made to review the contents of this EO before reproduction to ensure that it meets RCAF Standards so that technicians may derive from it the information necessary to maintain and service this equipment.

Where discrepancies are noted or deviations from accepted RCAF procedures or practices occur in this reproduction, AMCHQ is to be notified immediately by UCR so that revision action may be taken.

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TABLE OF CONTENTS

SECTION	PAGE
I Introduction.....	1
II Description.....	1-2
1. General.....	1
2. Detailed.....	1-2
III Installation.....	3
1. Mounting Starting Vibrator.....	3
2. Wiring.....	3
3. Completing Installation.....	3
IV Operation.....	4
1. Principles of Operation.....	4
2. Operation Instructions.....	4
V Service Inspection, Maintenance and Lubrication.....	4-5
1. Special Service Tools.....	4
2. Service Inspection.....	4-5
3. Maintenance.....	5
4. Lubrication.....	5
5. Service Troubles and Remedies.....	5
VI Disassembly, Inspection, Repair and Reassembly.....	5-10
1. Overhaul Tools Required.....	5
2. Disassembly.....	8
3. Cleaning, Inspection and Repair.....	9
4. Reassembly.....	9-10
VII Test Procedure.....	10-11
1. Electrical Testing Equipment.....	10
2. Testing Voltage and Adjusting Cut-in Point.....	10
3. Testing and Adjusting Amperage.....	10-11
4. Storage.....	11

PART LIST

VIII Introduction.....	11
IX Group Assembly Parts List.....	13-15
X Numerical Parts List.....	16
XI Standard Parts List.....	17
XII Service Tools.....	17

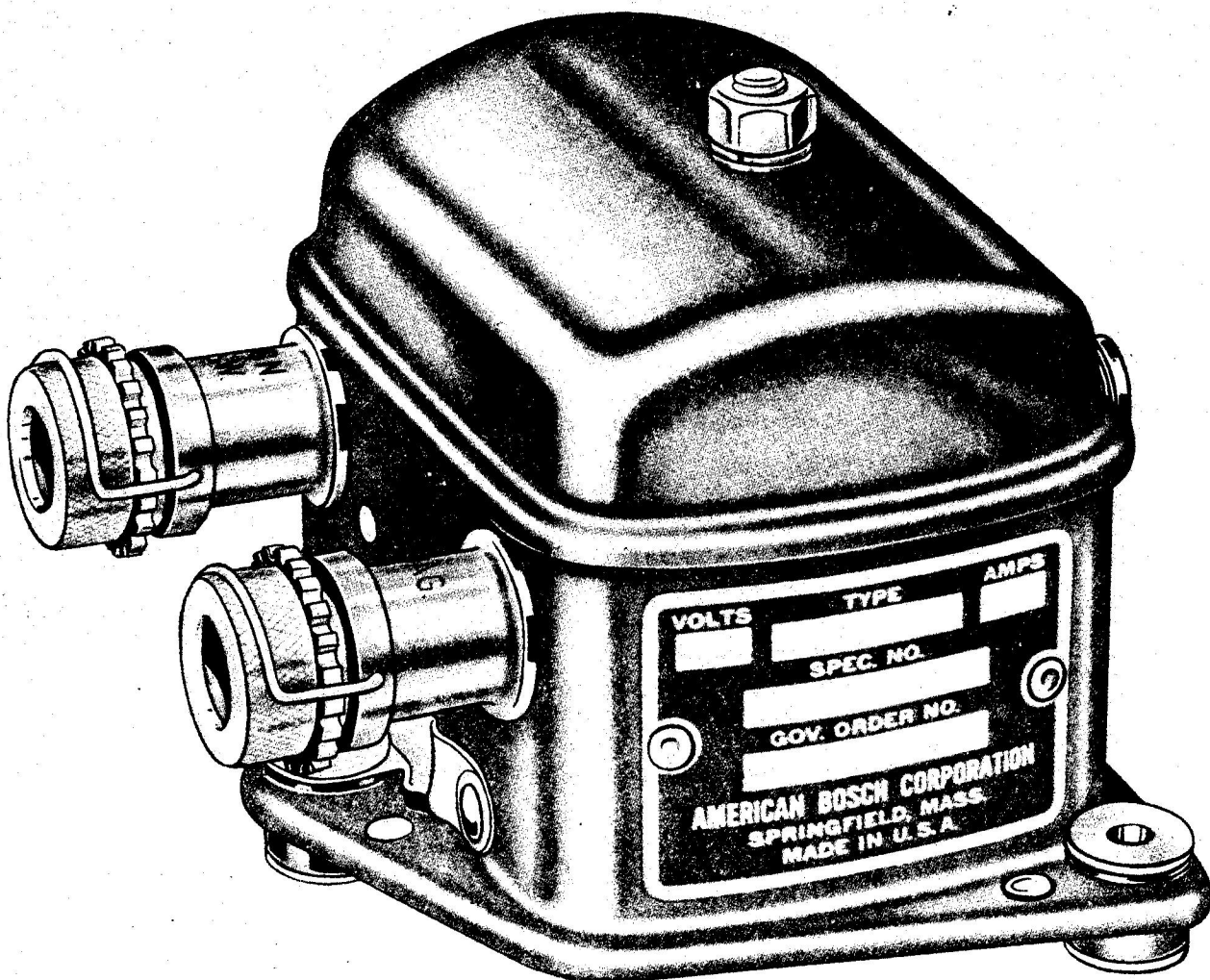


Figure 1 — B3 and B5 Series Starting Vibrator

SECTION I INTRODUCTION

1. This Handbook is issued as the basic instructions for the equipment involved. It contains Operation and Service Instructions, Overhaul Instructions and a **Part List**.

2. The Models covered by this Handbook are VJR12B3, VJR24B3, VJR24B3X, VJR12B5, VJR12B5X, VJR24B5 and VJR24B5X Starting Vibrators, as manufactured by the American Bosch

Corporation, Springfield, Massachusetts.

3. The manufacturer's drawing number appears as the type number on the name plate.

4. The figure "12" in the type number denotes 12 volt model and operates from a 12 volt battery. The figure "24" denotes 24 volt model and operates from a 24 volt battery.

SECTION II DESCRIPTION

1. GENERAL.

a. American Bosch B3 and B5 Series Starting Vibrators are designed for use as an auxiliary source of ignition to facilitate starting of aircraft engines. They provide a simple and efficient means of obtaining a shower of sparks for starting purposes and, after being installed, are put into operation simply by turning the engine ignition switch to the "ON" position and engaging the starter.

b. To suppress high frequency radio disturbances the B5 Series models are equipped with condensers connected between the positive terminal and ground. The B3 Series is not equipped with these condensers.

2. DETAILED. (See figure 2.)

a. SUBASSEMBLIES.

(1) These units consist of a housing and base plate, carrying the vibrator and relay coils and yokes, condensers, insulation plates and washers and various other nonserviceable parts. These parts are either riveted or bolted to the base plate or housing over which a bottom plate assembly is also riveted and no attempt will be made to disassemble them under any circumstances. Parts which may be disassembled are covered thoroughly in section VI, paragraph 2.

(2) All models are equipped with rubber mounting grommets (14) and metal bushings (13) installed in the base of the housing through which the mounting bolts are to be installed. The purpose of the metal bushings is to limit the amount of compression on the rubber grommets.

(3) A ground connector (1) is riveted to the housing and extends over one of the mounting bolt holes

so that when a mounting bolt is installed in this hole the unit will automatically be grounded.

b. **RELAY.**—The relay consists of a yoke, coil and core (12), and an armature plate (11), which extends from one side of the yoke, over the coil and core, to the other side of the yoke. The armature plate is hinged and carries one of the relay contact points. The other relay point is stationary and is mounted on a bracket which is insulated from the yoke. The flat spring of the armature plate extends down into the housing and is placed in back of the knurled tension adjusting nut (10). The flat spring maintains the points in an open position when the unit is not operating.

c. VIBRATOR.

(1) The vibrator unit consists of a coil and core (8) supported by a yoke. A contact bracket (7) extends over the core of the coil, and carries the adjustable contact screw with point (5). This screw with point is locked in position by a contact screw fastening nut and lock washer.

(2) A vibrator armature plate (4), carrying the other vibrator contact point, extends from one side of yoke in such a manner that the point on armature plate is directly under the contact screw with point (5). The two flat springs of the armature plate extend to the opposite side of the yoke where they rest on the upper adjustable extension arms and maintain the points in a closed position when the vibrator is not in operation.

d. CONDENSERS.

(1) A condenser (2) is connected across the vibrator points to prevent arcing of the points during

the rapid making and breaking of the vibrator circuit. The condenser lead (3) is fastened to the vibrator yoke over the armature plate and vibrator coil lead, etc., by a fastening screw and lock washer.

(2) A group of three condensers, mounted between the base plate and bottom plate is connected from the positive terminal to ground on all B5 Series Vibrators. The purpose of these condensers is to by-pass to ground any high frequency radio distur-

bance, originating from within the magneto, which might otherwise feed back to the battery circuit during normal engine and magneto operations. The B3 Series units are not equipped with these condensers.

e. TOP COVER GASKET.—Models with an "X" suffixed to the type number denotes that they are equipped with an *aluminum* top cover gasket. All other models in the B3 and B5 Series have a *vellumoid* top cover gasket.

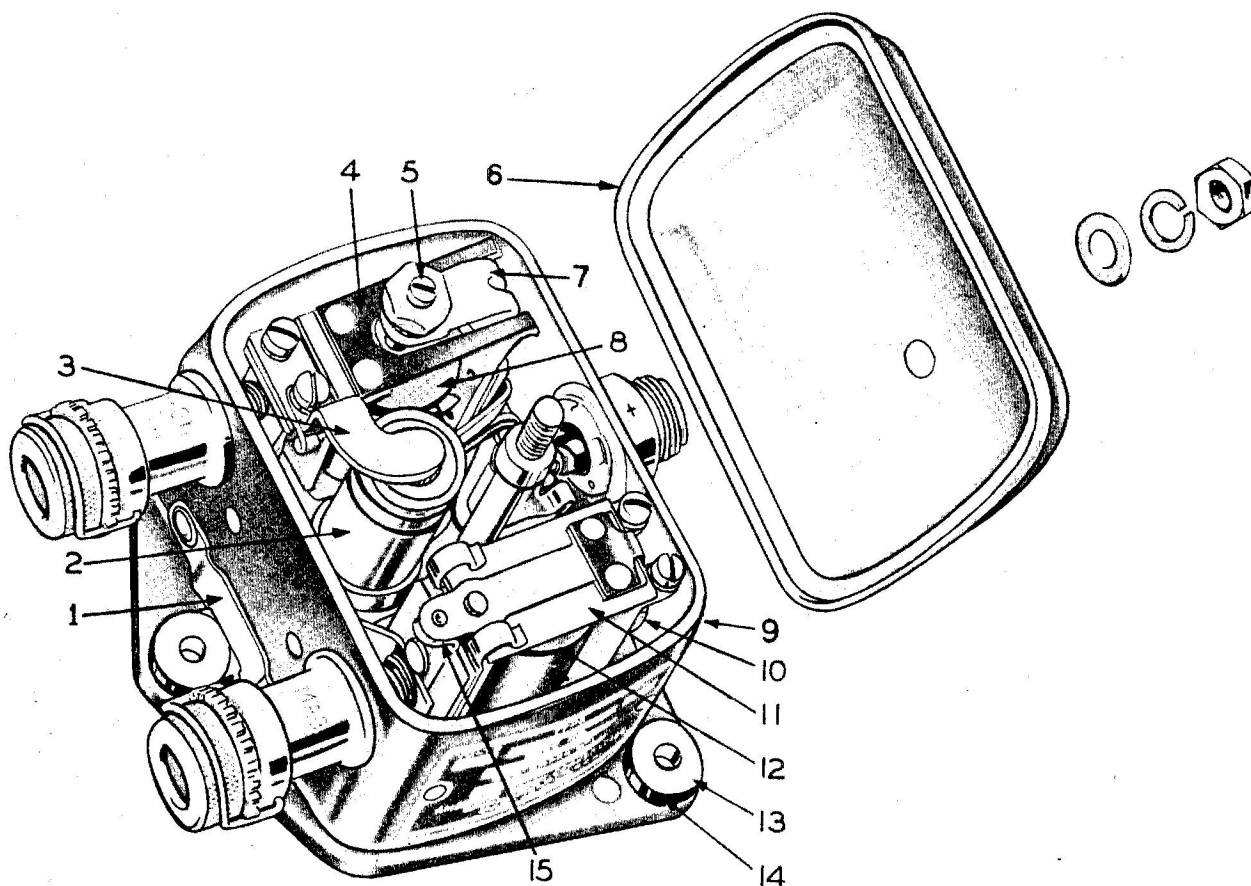


Figure 2 — Starting Vibrator With Top Cover Removed

KEY TO FIGURE 2

- | | | |
|----------------------------|---------------------------|--------------------------|
| 1. Grounding Plate | 6. Top Cover | 11. Relay Armature Plate |
| 2. Condenser | 7. Contact Bracket | 12. Relay Coil |
| 3. Condenser Lead | 8. Vibrator Coil | 13. Grommet Bushing |
| 4. Vibrator Armature Plate | 9. Housing | 14. Rubber Grommet |
| 5. Contact Screw w/Point | 10. Tension Adjusting Nut | 15. Relay Points |

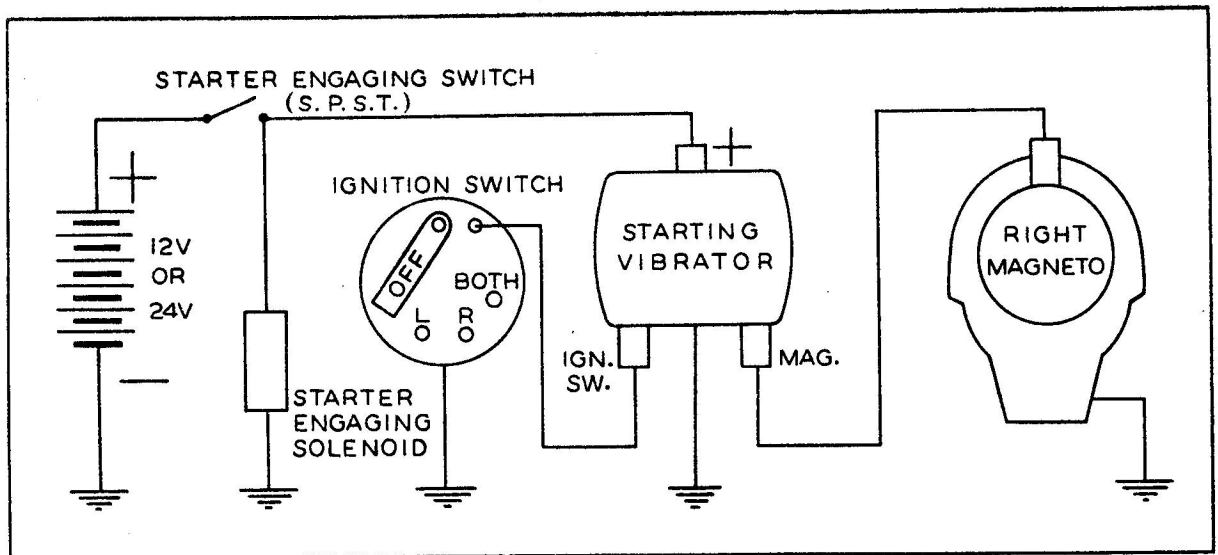


Figure 3 — Installation Wiring Diagram

SECTION III INSTALLATION

1. MOUNTING STARTING VIBRATOR. (See figure 5.)

a. Trip lock springs (19) and unscrew ignition and magneto outlet nuts (20). Remove insulation glands (21), terminals (22), and nuts with spring assemblies (23). Remove top cover fastening nut (39), lock washer (38), and plain washer (37) and lift off top cover (36).

Note

If top cover is secured with an elastic stop nut in place of plain nut, the lock washer and plain washer are omitted.

b. Mount unit on fire wall, or engine mount, using three No. 10 mounting bolts of proper length to suit installation, and secure with elastic stop nuts.

c. The unit will be automatically grounded when one of the mounting bolts is installed through grounding plate on housing.

2. WIRING. (See figures 3 and 5.)

Note

The low voltage wires mentioned below should not be smaller than No. 16 B & S gauge wire and must be run inside shielded conduits throughout.

a. Run a low-voltage wire from positive side of storage battery to starter engaging switch. Connect another low-voltage wire from starter engaging sole-

noid to other side of starter engaging switch and continue to positive cable post (30) in vibrator, by attaching wire to terminal clip (17) and fastening to terminal post by means of plain washer (33), lock washer and screw (34).

b. Connect low-voltage wire from ignition switch post for right-hand magneto to "IGN. SW." terminal of vibrator.

Note

On installations where an extra grounding terminal is provided on the magneto, the unit may be wired as shown in figure 4. When this system of wiring is used, the "IGN. SW." terminal parts need not be disassembled, as they are not used, and when left in place they will serve to plug the outlet.

c. Run low-voltage wire from starting vibrator "MAG." terminal to right-hand magneto low tension terminal.

3. COMPLETING INSTALLATION. (See figure 5.)

Reinstall top cover (36) and gasket (35), and secure with plain washer, lock washer and nut.

Note

If top cover is secured with an elastic stop nut in place of plain nut, the lock washer and plain washer are omitted.

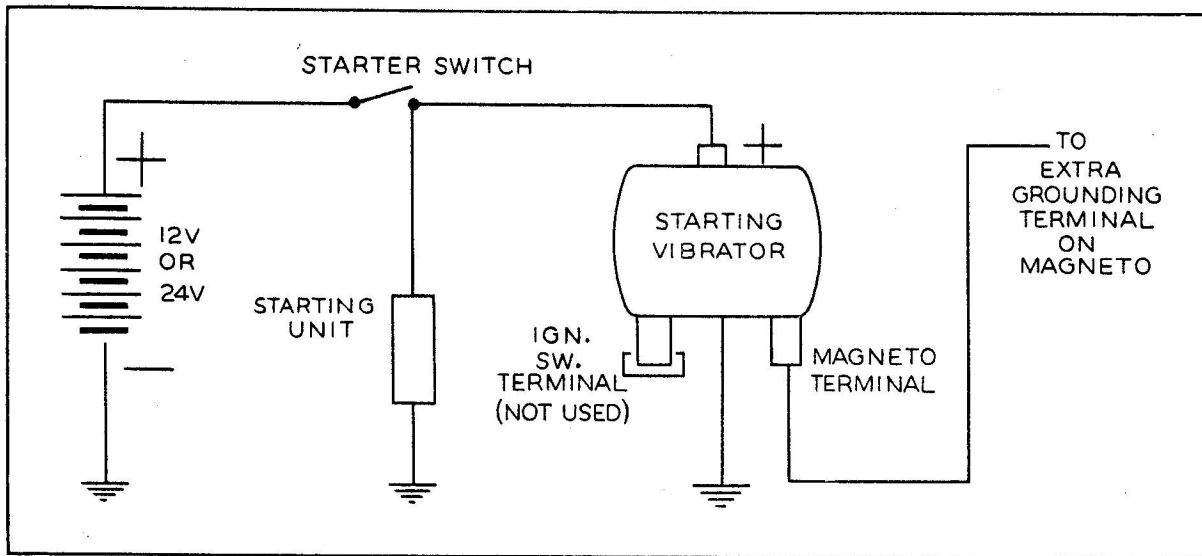


Figure 4 — Alternate Installation Wiring Diagram

SECTION IV OPERATION

1. PRINCIPLES OF OPERATION. (See figure 3.)

a. When the engine ignition switch is in the "ON" position and the starter is engaged, the current from the battery is sent through the coil of the relay, causing the relay points to close. The closing of the relay points completes the circuit to the vibrator coil, and the vibrator transmits a rapidly interrupted current.

b. This current is sent through the primary winding of the magneto coil where, by induction, a high voltage is created in the secondary winding of the magneto coil.

c. This produces a shower of high-tension sparks which are delivered to the spark plugs through the magneto distributor rotor and distributor block electrodes when the magneto contact points are open.

d. The initial sparks delivered are timed in advance, and the sparks which follow gradually taper off into retard until the magneto contact points close, and the current is by-passed to ground. This action is repeated each time the magneto contact points are separated, sending the interrupted current again through the primary of the magneto coil, where the action as outlined above, again occurs.

e. This action continues until the engine is firing under the regular magneto spark and the engaging starter is released.

2. OPERATION INSTRUCTIONS.—No special operation instructions need be followed as the vibrator automatically starts to function when switch is in the "ON" position and the starter is engaged and ceases to function when the starter is disengaged.

SECTION V SERVICE INSPECTION, MAINTENANCE, AND LUBRICATION

1. SPECIAL SERVICE TOOLS.—No special tools are required for service inspection and maintenance.

2. SERVICE INSPECTION. (See figure 2.)

Note

In accordance with T. O. No. 00-20A-2, a summary of the periodic inspections pre-

scribed in section V will be entered on the Master Airplane Maintenance Instruction Forms maintained in the back of the Form 41B for the airplanes affected.

COLUMN NO. 22
IGNITION, AND ELECTRICAL
100-Hour Inspection

Remove the top cover fastening nut, lock washer, and plain washer on top of unit, and remove top cover and gasket. "X" model vibrators are equipped with an aluminum top cover gasket and should not need replacing unless visual inspection reveals that it is gouged or bent so badly that a good metal to metal contact cannot be made between the top cover and housing. All other models are equipped with a vellumoid top cover gasket and if inspection shows it to be worn or badly compressed, or if better radio shielding is desired, remove all shellac from top cover and install a new aluminum gasket. Scribe an "X" after the type number on the name plate which will denote that an aluminum gasket has been installed. Do not shellac the aluminum gasket to the top cover.

The terminal nut assemblies must be in position and firmly contact the terminal strip within the unit. If inspection reveals that this is not the case, trip the lock springs, and tighten the slotted nuts until a firm contact is made. The lock springs must be in position and secure after this operation.

Check the tightness of the screw securing the positive cable to the unit. This screw must be secure. If inspection reveals it to be other than the above, retighten securely.

Inspect unit for security of mounting. Tighten mounting bolts if necessary.

3. MAINTENANCE.—Maintenance will be confined to minor external and connecting parts and no

adjustment of armature tensions will be attempted while the unit is installed.

4. LUBRICATION.—No lubrication of any kind is required on this unit.

5. SERVICE TROUBLES AND REMEDIES.

a. A number of so called starting vibrator failures may be caused by faulty spark plugs, defective switch cable or switch, damaged or incorrect external wiring or weak battery. In the following chart it is assumed that these items have been separately investigated with faults having been traced directly to the starting vibrator.

b. In addition to the probable causes listed below, failure of the unit to function may be caused by internal open circuits, excessively worn or pitted vibrator points, improper relay point opening, etc. Some of these troubles can be corrected at the overhaul shop but only the remedies listed below should be attempted by maintenance personnel. If the remedies listed below do not correct the trouble it will be necessary to remove the complete unit and install a new or overhauled one of the proper type.

CAUTION

Do not attempt to make any adjustments while the unit is installed.

Return the removed unit to the overhaul shop where the necessary testing and adjusting equipment is available for locating and correcting the trouble.

SERVICE TROUBLES AND REMEDIES

TROUBLE	PROBABLE CAUSES	REMEDY
UNIT FAILS TO FUNCTION	Unit not grounded	Mounting bolt must be contacting grounding plate.
	Loose or disconnected positive cable	Make sure terminal clip is secured to positive cable and positive terminal post.
	Loose or disconnected "MAG." or "IGN. SW." terminals	Check to see that "MAG." and "IGN. SW." cables are secured to terminal nuts with springs. Tighten slotted nuts so that a firm contact is made with the terminal within the unit.

SECTION VI DISASSEMBLY, INSPECTION, REPAIR, AND REASSEMBLY

1. OVERHAUL TOOLS REQUIRED.

PART NO.	NOMENCLATURE	APPLICATION
TSE 702	Adjusting tool	For adjusting hooked arms of relay yoke and arms of vibrator yoke.

KEY TO FIGURE 5

- | | |
|---|---|
| 1. Supporting plate | 23. Nut with spring |
| 2. Screw and lock washer, (short) for vibrator armature plate | 24. Condenser lead |
| 3. Vibrator armature plate | 25. "MAG." outlet |
| 4. Vibrator yoke extension arms | 26. Relay point (non-removable) |
| 5. Housing | 27. Relay yoke adjusting arms |
| 6. Mounting grommet | 28. Relay coil |
| 7. Grommet bushing | 29. Relay yoke |
| 8. "IGN. SW." outlet | 30. Positive terminal post |
| 9. Vibrator coil lead | 31. Positive cable outlet |
| 10. Vibrator yoke | 32. Tension adjusting nut |
| 11. Condenser | 33. Plain washer for positive terminal screw |
| 12. Screw and lock washer, (long) for vibrator armature plate | 34. Screw and lock washer for positive terminal clip |
| 13. Vibrator coil | 35. Top cover gasket |
| 14. Contact bracket | 36. Top cover |
| 15. Lock washer for contact screw | 37. Plain washer for top cover |
| 16. Contact screw with point | 38. Lock washer for top cover |
| 17. Positive terminal clip | 39. Top cover fastening nut |
| 18. Fastening nut for contact screw | 40. Relay armature plate |
| 19. Lock spring | 41. Plain washer for relay armature plate fastening screw |
| 20. Outlet nut | 42. Lock washer for relay armature plate fastening screw |
| 21. Insulation gland | 43. Relay armature plate fastening screw |
| 22. Insulated terminal | |



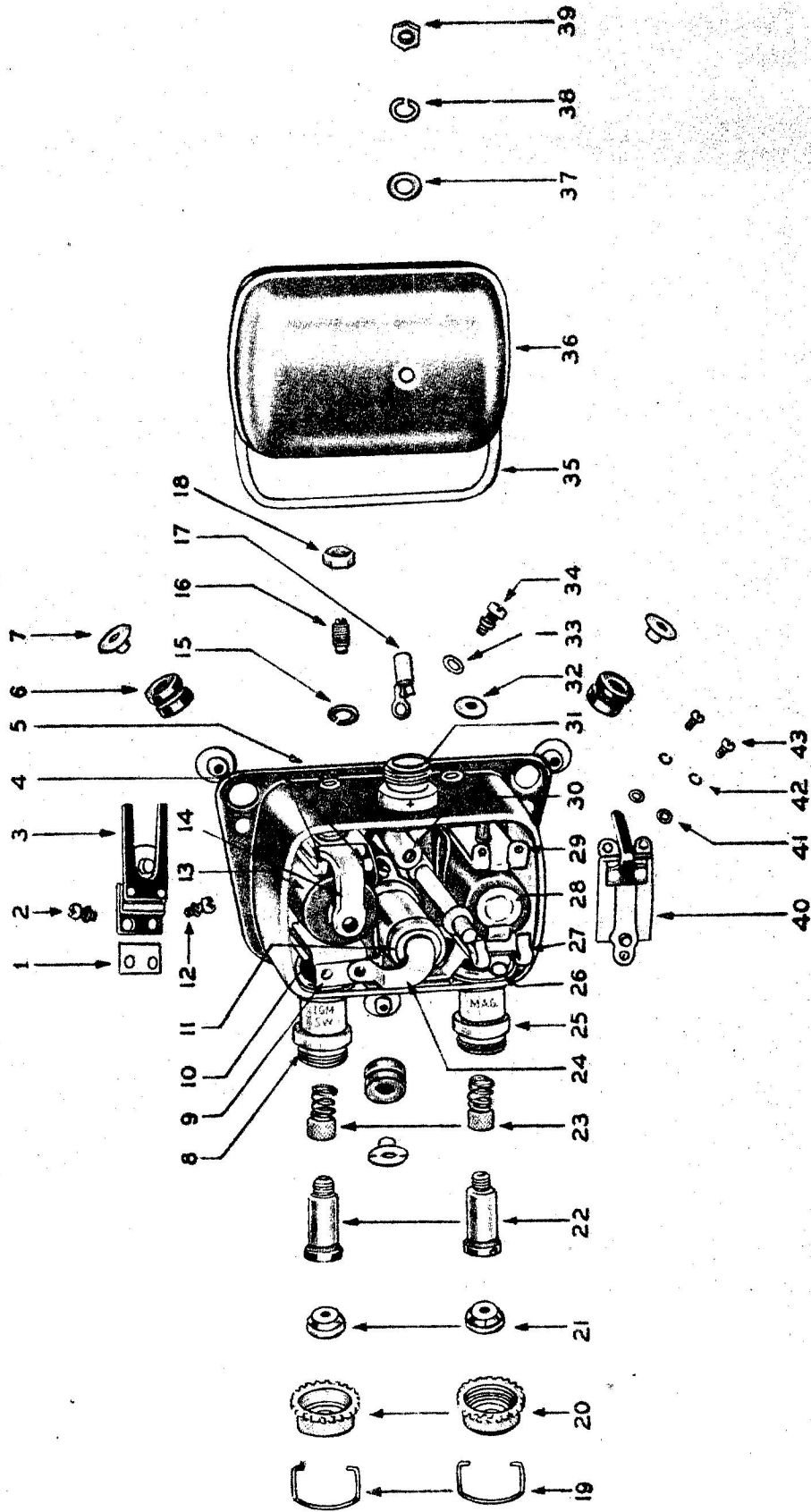


Figure 5 — Starting Vibrator Disassembled

2. DISASSEMBLY. (See figures 5 and 6.)

Note

Disassembly of the unit will be carried out only to the extent herein described.

a. **TOP COVER (36).**—Remove top cover fastening nut (39), lock washer (38), and plain washer (37). Lift off top cover.

Note

If top cover is secured with an elastic stop nut in place of the plain nut, the lock washer and plain washer are omitted.

b. **MAGNETO AND IGNITION OUTLETS**

(1) Trip lock springs (19) on "MAG." and "IGN. SW." outlets and unscrew outlet nuts (20). A gentle pull on cables will remove insulation glands (21), terminals (22) and terminal nuts with springs (23).

(2) With screw driver, unscrew positive cable fastening screw (34) and remove positive cable attached to clip (17).

c. **PREDISASSEMBLY TEST. (See figure 6.)**

(1) At this point test the unit as follows:

(a) Connect a wire from "MAG." outlet (25) on vibrator to a standard 6-volt battery ignition coil and ground the other side of coil.

(b) Connect a lead from the high-tension terminal of the coil to a spark gap having sharp points and set at 9 mm. Connect other side of spark gap to ground.

(c) Connect a wire from the positive side of a fully charged 12-volt storage battery through a single pole, single throw switch, and an ammeter having a range of 0 to 5 amperes, to the positive cable post

in the induction vibrator. Negative side of storage battery must be connected to ground.

(d) The vibrator is automatically connected to ground when one of the mounting bolts is installed through the grounding plate.

(e) When the switch from storage battery to induction vibrator is closed, the vibrator must fire the 9 mm gap without missing and the ammeter reading should be between the following limits:

12 volt models.....	3.2 to 3.6 amperes
24 volt models.....	2.6 to 3.1 amperes

(2) If the vibrator passes the above test; further disassembly is discouraged. As the unit is not in use during flight, and is used only to start the engine, and then only for a matter of seconds, very little, if any, wear will be in evidence. The contact points should not be misconstrued as being subjected to the same wear, or needing the same attention, as magneto contact points. A smoky appearance and evidence of contact arcing are normal and should not be considered of sufficient importance to require disassembly and cleaning. In very remote and extreme cases, after a very long period of use, it may become necessary to clean and adjust the points. However, if the unit passes the above test, it can be assumed that the points do not need cleaning and are in proper alignment. *If the unit fails to pass the above test, then, and then only, the following disassembly instructions should be followed.*

d. Remove the three mounting bolts which hold vibrator in place and remove complete unit.

e. **CONTACT POINT AND ARMATURE PLATE. (See figure 5.)**

(1) With a 1/16-inch socket wrench, remove nut (18) on contact screw with point (16) and lift off lock

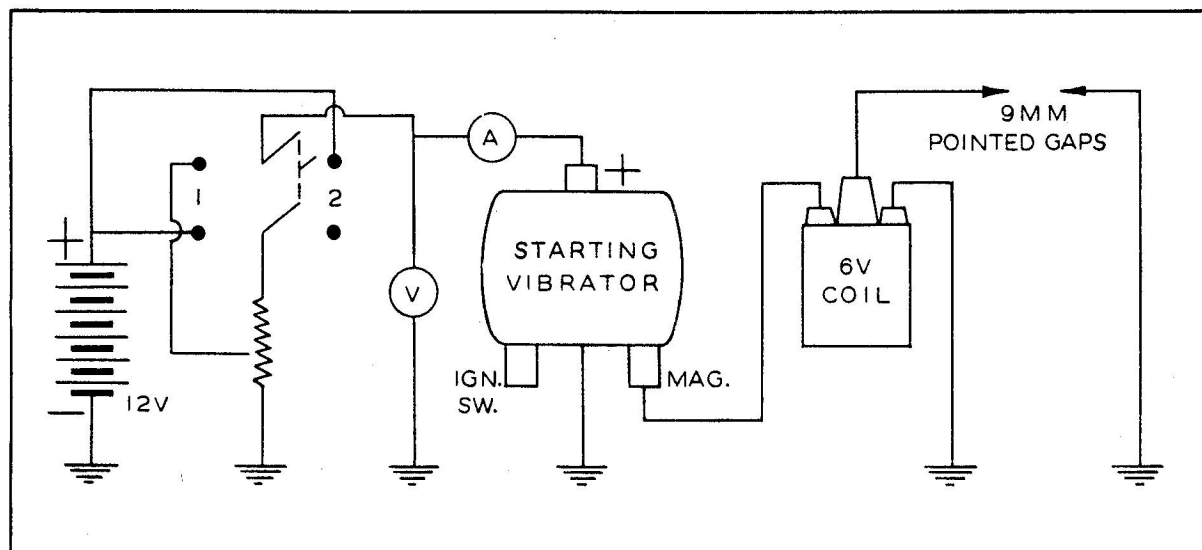


Figure 6 — Wiring Diagram — Predisassembly Test.

washer (15). Using a screw driver, remove contact screw with point.

(2) The other vibrator point is part of the vibrator armature plate (3) and must be removed with the plate. With the screw driver, remove the two screw and lock washer combinations (2 and 12) which fasten the armature plate to the vibrator yoke and remove the vibrator plate. Also remove the small two-hole plate (1) under the hinged end of the armature plate.

f. **RELAY ARMATURE PLATE.**—Turn knurled tension adjusting nut (32) on stud of relay yoke until it is nearly to the end of threaded portion of stud. Using a screw driver, remove the two screws (43), lock washers (42), and plain washers (41), holding relay armature plate (40) to yoke. Slide armature plate toward positive bushing side of vibrator housing, until it clears the two hooked arms on opposite end of yoke, and remove.

3. CLEANING, INSPECTION, AND REPAIR.

a. Inspect vibrator points for evidence of wear, deposits, etc. If the points are badly eroded, or show evidence of excessive burning, or transfer of contact material, they must be replaced by new ones. If only slight transfer has taken place, the peaks may be removed with a fine dressing stone and the points used over again. Before reinstalling the unit, wash the removed vibrator and relay points in carbon tetrachloride and dry immediately with a blast of compressed air. Clean the nonremovable relay point on one end of relay yoke by drawing a piece of highly calendered kraft paper dipped in carbon tetrachloride over it and dry immediately with a blast of compressed air.

b. Inspect all studs for security.

c. Inspect threaded parts for worn condition of threads.

d. If inspection of coils indicates they have been damaged, the entire unit must be replaced.

4. REASSEMBLY. (See figures 5, 7 and 8.)

a. **RELAY ARMATURE PLATE.** (See figures 5 and 7.)

(1) Slip tension spring of relay armature plate (40) down inside vibrator housing and press down on point end of armature plate until it slips under hooked arms (27) on opposite end of relay yoke and rests on nonremovable point (26).

(2) Raise screw fastening end of armature plate and press tension spring until it slips behind the knurled tension adjusting nut (32).

(3) Place the lock and plain washers (42 and 41) on the screws (43) and insert screws while aligning the points. When the points are in perfect alignment,

tighten relay armature plate fastening screws securely. Check point alignment again after tightening operation.

(4) Check relay point opening. This must be .015 to .020 inch with relay armature plate resting flatly against both arms (27). If this is not found, use American Bosch tool TSE 702 and adjust arms (27) to give the proper point opening. (See figure 7.) After this adjustment, make certain that the relay armature plate, when in a free position, lies flat against both arms.

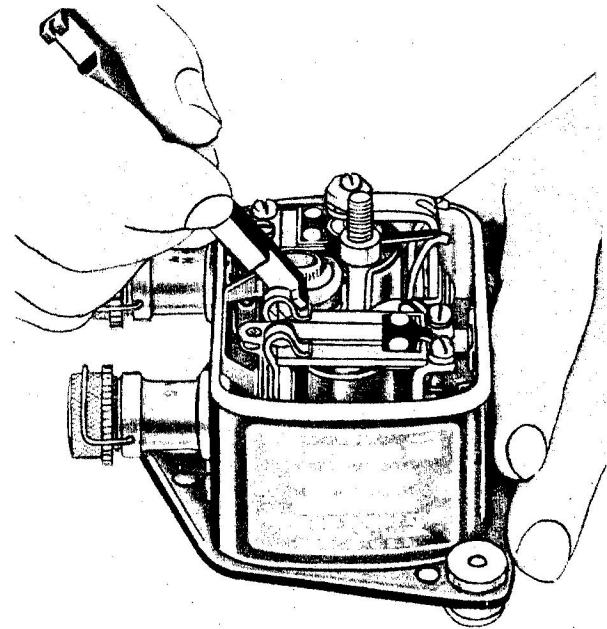


Figure 7 — Adjustment of Relay Contact Point Opening

b. **CONTACT POINT AND ARMATURE PLATE.** (See figure 5.)

(1) Slide armature plate (3), with contact point facing up, over coil so that the flat springs rest on extension arms (4) and hinge end rests on end of yoke (10), under coil lead (9) and condenser lead (24).

(2) Slip supporting plate (1) between armature plate (3) and yoke (10) so that when holes are aligned, edge of supporting plate will also be aligned with ends of armature plate and yoke.

(3) Insert the screw and lock washer combination (2 and 12) and tighten moderately. Note that the long screw (12) is inserted through the condenser lead (24).

(4) Insert vibrator contact screw with point (16) into fastening nut (18) and place lock washer (15) under nut. Screw contact screw with point in contact bracket (14), tighten down until vibrator points just touch.

(5) Slide a .035-inch feeler gauge between rivet on bottom of armature plate and core of vibrator coil

Sections VI-VII

(13). With a screw driver turn down contact screw until a slight pull is required to release feeler gauge.

(6) Tighten contact screw fastening nut securely, while holding contact screw with point (2) in place with a screw driver.

Note

If unit is equipped with a locking clip instead of lock washer, bend ear of clip against flat

side of fastening nut to hold nut securely in place.

(7) Loosen vibrator armature plate fastening screws (2 and 12) and move armature plate until points are aligned, and spring arms of armature plate are equally spaced on either side of stationary contact bracket (14).

(8) Before proceeding with further adjustments, unit must be tested as outlined in section VII.

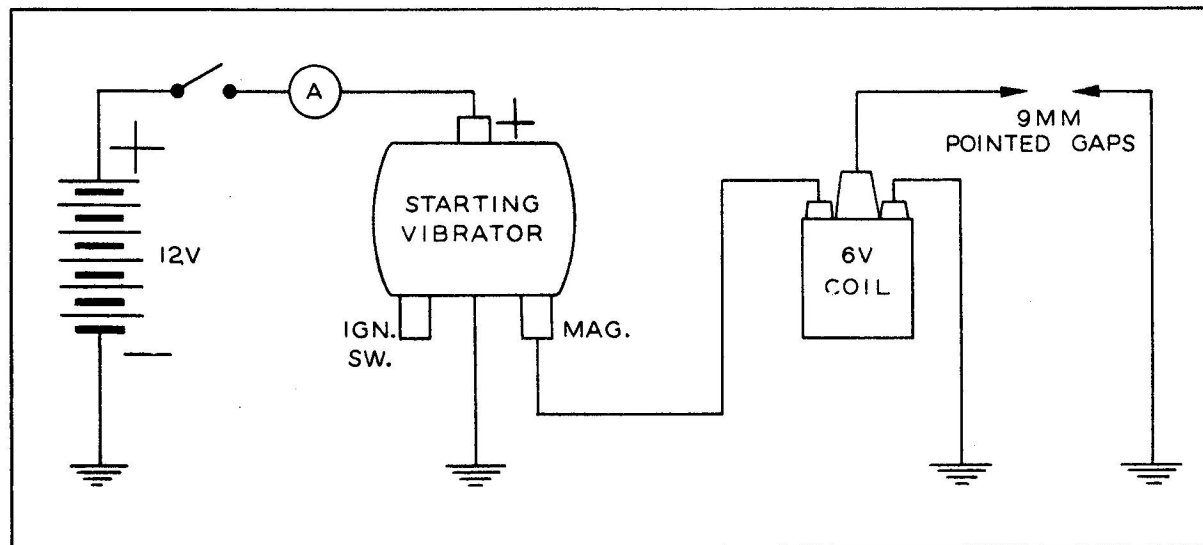


Figure 8 — Wiring Diagram — Test for Overhaul

SECTION VII TEST PROCEDURE

1. ELECTRICAL TESTING EQUIPMENT. (See figures 5 and 8.)

a. The test stand, on which the electrical tests are made, must ground the vibrator housing. This test stand should consist of a fully charged 12-volt storage battery, 20- to 30-ohm potentiometer rheostat, with a current carrying capacity of approximately 1 ampere, 0- to 5-scale ammeter, 0- to 15-scale voltmeter, 6-volt battery ignition coil, adjustable spark gap and a double-pole, double-throw switch.

b. The above equipment should be wired as shown in figure 8.

2. TESTING VOLTAGE AND ADJUSTING CUT-IN POINT. (See figures 5 and 8.)

a. With switch in position marked "1" in figure 8, drop voltage by means of potentiometer to nearly zero and then gradually increase voltage and note point of cut-in, or volts at which the relay points

close. If other than 4 to 6 volts on the 12 volt models or 8 to 10 volts on the 24 volt models, turn relay armature plate tension adjusting nut (32) or in extreme cases, change relay contact point opening within limits, to obtain the proper cut-in point.

b. If the proper cut-in point cannot be obtained by the above methods, the complete unit must be replaced by a new one.

3. TESTING AND ADJUSTING AMPERAGE. (See figures 5, 8 and 9.)

a. Throw switch to position marked "2" in figure 8, and note ammeter reading. If other than 3.2 to 3.6 amperes on the 12 volt models or 2.6 to 3.1 amperes on the 24 volt models, adjust both vibrator tension arms (4) evenly, with American Bosch adjusting tool TSE 702 until proper ammeter readings are obtained. (See figure 9.) After this adjustment the unit must fire the 9 mm gap without missing.

b. If the proper adjustments and readings cannot be obtained by the above methods, the complete unit must be replaced with a new one.

c. Proper adjustments and readings having been obtained, unit is now ready to be installed.

4. STORAGE—In cases where the unit is not to be reinstalled but is to be stored for future use, install top cover with top cover gasket after thorough inspection. If gasket is worn or badly compressed, replace with a new aluminum gasket as outlined in paragraph 2 of section V. Outlets must be plugged or capped to prevent moisture or foreign material from getting into the vibrator. Wrap the unit in waterproof paper, and store in driest location available.

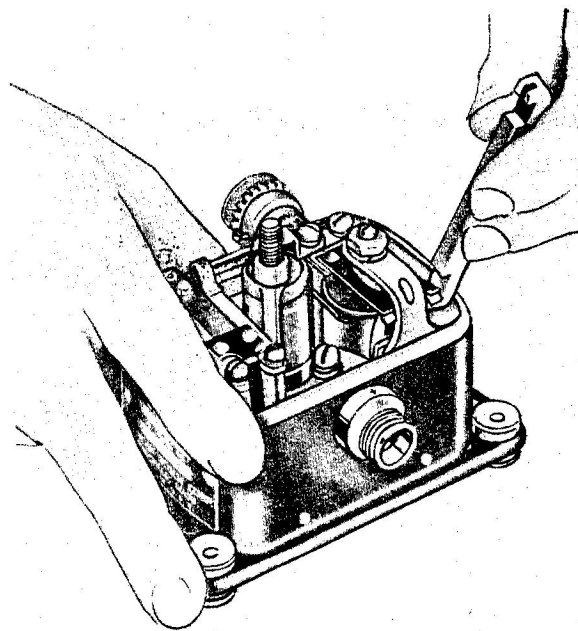


Figure 9 — Adjustment of Vibrator Tension Arms

PART LIST

SECTION VIII

INTRODUCTION

1. This Part List lists and describes all procurable parts for the maintenance of the following models of Starting Vibrators manufactured by American Bosch Corporation, Springfield, Massachusetts, U.S.A.

VJR12B3
 VJR24B3
 VJR24B3X
 VJR12B5
 VJR12B5X
 VJR24B5
 VJR24B5X

2. Non-procurable parts which have lost their identity by being fabricated or molded into a permanent assembly are not listed. Non-procurable parts which have not lost their identity are listed for

identification purposes only and the part number is preceded by an asterisk (*).

3. The Group Assembly Parts List, section IX, lists the procurable parts in the order in which they are to be assembled to make up the major assembly. The quantities specified are those used at the location shown and not necessarily the total number used per accessory.

4. The Numerical Parts List, section X, lists all parts, except standard parts, in numerical order in accordance with Technical Order No. 00-35A-6.

5. Standard Parts are listed numerically with a brief nomenclature in Section XI.

6. Section XII illustrates and describes the only special tool necessary to overhaul these Starting Vibrators. This tool is not to be used as a Service Tool and is supplied only as an Overhaul Tool.

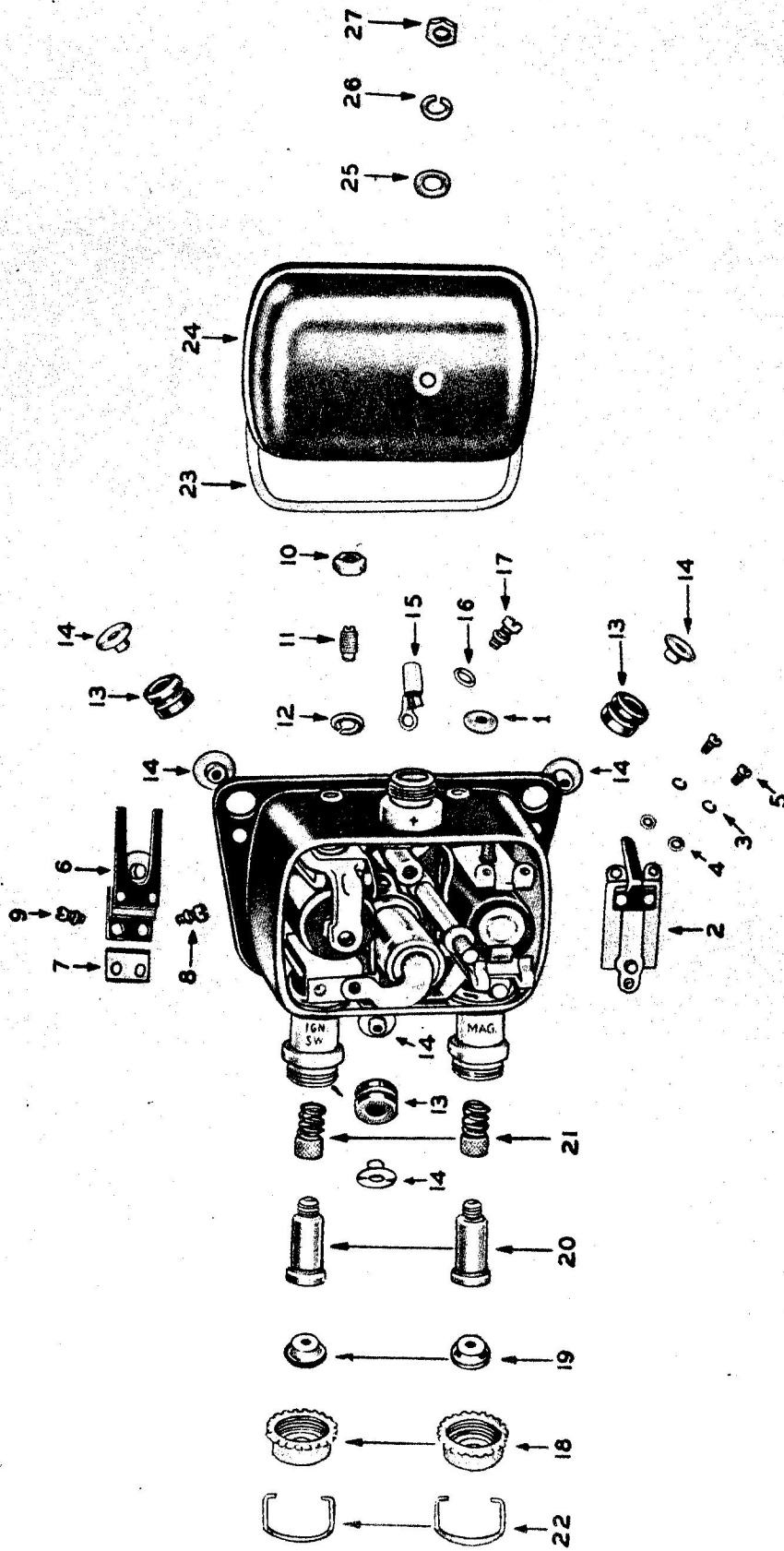


Figure 10 — Exploded View of Starting Vibrator

SECTION IX — GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	SOURCE	GROUP AIRCRAFT ACCESSORY		UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY	STARTING VIBRATOR ASSEMBLY — B3 AND B5 SERIES		U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1 2 3 4 5 6				
1	—		VJR12B3	Basic Starting Vibrator Assembly		4270		137F
			*HG 714	Housing assembly	1			
			*HG 713	Housing	1			
			*BG 715	Bushing — Ignition Switch cable	1			
			*BG 716	Bushing — Magneto cable	1			
			*BG 717	Bushing — Positive terminal cable	1			
			*NP 5232	Plate — Name	1			
			*RI 1042	Rivet — Name plate	2			
			*BE 713	Plate assembly — Base	1			
			*EC 715	Connector — Ground	1			
			*YO 712	Yoke Assembly — Relay	1			
			*YO 716	Yoke	1			
			*PL 7110	Plate — Stop (w/hooked arms)	1			
			*BK 712	Bracket w/point — Contact	1			
			*CL 713	Coil Assembly — Relay	1			
			*YO 711	Yoke Assembly — Vibrator	1			
			*YO 7049	Yoke	1			
			*BK 7024	Bracket — Contact	1			
			*CL 711	Coil Assembly — Vibrator	1			
			*EC 717	Terminal	1			
			*CW 711	Condenser	1			
			*EC 712	Connector — Terminal	1			
			*GA 715	Gasket — Bottom plate	1			
			*PL 7124	Plate Assembly — Bottom	1			
10	1		NT 1096	Nut — Tension adjusting	1	4270		137F
10	2		PL 716	Plate w/point — Relay armature	1	4270		137F
10	3		AN 935-6	Washer — Lock (armature plate screw)	2	6700		128
10	4		WA 1036	Washer — Plain (armature plate screw)	2	4270		137F
10	5		SC 19-3 CA	Screw — Relay armature plate fastening	2	4270		137F
10	6		PL 70131	Plate w/point — Vibrator armature	1	4270		137F
10	7		PL 7013	Plate — Vibrator armature support	1	4270		137F
10	8		SC 1229	Screw and lock washer — Armature plate (long)	1	4270		137F
10	9		SC 1175	Screw and lock washer — Armature plate (short)	1	4270		137F
10	10		NT 8-8 CA	Nut — Contact screw securing	1	4270		137F
10	11		CS 86436	Screw w/point — Contact	1	4270		137F
10	12		AN 935-416	Washer — Lock (contact screw)	1	6700		128
10	13		IS 715	Grommet — Rubber mounting	3	4270		137F
10	14		BG 7110	Bushing — Grommet	6	4270		137F
10	15		EC 1037	Clip — Terminal	1	4270		137F
10	16		WA 86678	Washer — Plain (Terminal clip screw)	1	4270		137F
10	17		SC 1233	Screw and lock washer — Terminal clip	1	4270		137F
10	18		AN 3105-6	Nut — "Mag." and "Ign. Sw." outlet	2	4716		137B
10	19		IS 52133	Gland — Insulation	2	4270		137F
10	20		AN 3105-3	Terminal — Insulation	2	4716		137B
10	21		AN 3105-2	Nut w/spring — Terminal	2	4716		137B
10	22		SP 52104	Spring — Lock	2	4270		137F
10	23		GA 714	Gasket — Top cover (vellumoid)	1	4270		137F
10	24		CV 712	Cover — Top	1	4270		137F
10	25		WA 1067	Washer — Plain (top cover)	1	4270		137F
10	26		AN 935-416	Washer — Lock (top cover)	1	6700		128

SECTION IX — GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	STOCKED	GROUP	AIRCRAFT ACCESSORY						UNITS PER ASSY	PROPERTY CLASSIFICATION		
				MAJOR ASSEMBLY	STARTING VIBRATOR ASSEMBLY — B3 AND B5 SERIES						U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1	2	3	4	5	6				
				NOMENCLATURE									
10	27		NT 6-8 CA	Nut — Top cover fastening						1	4270	137F	
			VJR12B5	Starting Vibrator Assembly							4270	137F	
				Same as basic Vibrator VJR12B3									
			EXCEPT:										
			ADD										
			*CD 1002	Condenser — Radio interference suppressing						3			
1	—		VJR12B5X	Starting Vibrator Assembly							4270	137F	
				Same as basic Vibrator VJR12B3									
			EXCEPT:										
			OMIT										
			*GA 715	Gasket — Bottom plate						1			
10	23		GA 714	Gasket — Top cover (vellumoid)						1	4270	137F	
			ADD										
			GA 716	Gasket — Top cover (aluminum)						1	4270	137F	
			*CD 1002	Condenser — Radio interference suppressing						3			
1	—		VJR24B3	Starting Vibrator Assembly							4270	137F	
				Same as basic Vibrator VJR12B3									
			EXCEPT:										
			OMIT										
			*HG 714	Housing assembly						1			
			*CL 713	Coil assembly — Relay						1			
			ADD										
			*HG 715	Housing assembly						1			
			*CL 714	Coil assembly — Relay						1			
1	—		VJR24B3X	Starting Vibrator Assembly							4270	137F	
				Same as basic Vibrator VJR12B3									
			EXCEPT:										
			OMIT										
			*HG 714	Housing assembly						1			
			*CL 713	Coil assembly — Relay						1			
			*GA 715	Gasket — Bottom plate						1			
10	23		GA 714	Gasket — Top cover (vellumoid)						1			
			ADD										
			*HG 718	Housing assembly						1			
			*CL 714	Coil assembly — Relay						1			
			GA 716	Gasket — Top cover (aluminum)						1	4270	137F	

SECTION IX — GROUP ASSEMBLY PARTS LISTS

FIG. NO.	INDEX NO.	S E R I E S	GROUP AIRCRAFT ACCESSORY		UNITS PER ASSY	PROPERTY CLASSIFICATION		
			MAJOR ASSEMBLY	STARTING VIBRATOR ASSEMBLY — B3 AND B5 SERIES		U.S. NAVY	U.S. ARMY	BRITISH
			PART NUMBER	1 2 3 4 5 6 NOMENCLATURE				
1			VJR24B5	Starting Vibrator Assembly Same as basic Vibrator VJR12B3		4270		137F
			EXCEPT:					
			OMIT					
			*HG 714	Housing assembly	1			
			*CL 713	Coil Assembly — Relay	1			
			ADD					
			*HG 715	Housing assembly	1			
			*CL 714	Coil assembly — Relay	1			
			*CD 1002	Condenser — Radio interference suppressing	3			
1			VJR24B5X	Starting Vibrator Assembly Same as basic Vibrator VJR12B3		4270		137F
			EXCEPT:					
			OMIT					
			*HG 714	Housing assembly	1			
			*CL 713	Coil assembly — Relay	1			
			*GA 715	Gasket — Bottom Plate	1			
10	23		GA 714	Gasket — Top cover (vellumoid)	1	4270		137F
			ADD					
			*HG 715	Housing assembly	1			
			*CL 714	Coil assembly — Relay	1			
			*CD 1002	Condenser — Radio interference suppressing	3			
			GA 716	Gasket — Top cover (aluminum)	1	4270		137F

SECTION X — NUMERICAL PARTS LIST

PART NUMBER	GROUP LIST PAGE NUMBERS	TOTAL QUANTITY	PART NUMBER	GROUP LIST PAGE NUMBERS	TOTAL QUANTITY	PART NUMBER	GROUP LIST PAGE NUMBERS	TOTAL QUANTITY
BE 713	13	1	NT 1096	13	1			
BG 7110	13	6	NT 6-8 CA	14	1			
BG 715	13	1	NT 8-8 CA	13	1			
BG 716	13	1	PL 7013	13	1			
BG 717	13	1	PL 70131	13	1			
BK 7024	13	1	PL 7124	13	1			
BK 712	13	1	PL 716	13	1			
CD 1002	13	3	PL 7110	13	1			
CL 711	13	1	RI 1042	13	2			
CL 713	13	1	SC 1175	13	1			
CL 714	14	1	SC 1229	13	1			
CS 86436	13	1	SC 1233	13	1			
CV 712	13	1	SC 19-3 CA	13	2			
CW 711	13	1	SP 52104	13	2			
EC 1037	13	1	VJR12B3	13	1			
EC 712	13	1	VJR12B5	14	1			
EC 715	13	1	VJR12B5X	14	1			
EC 717	13	1	VJR24B3	14	1			
GA 714	13	1	VJR24B3X	14	1			
GA 715	13	1	VJR24B5	15	1			
GA 716	14-15	1	VJR24B5X	15	1			
HG 713	13	1	WA 1036	13	2			
HG 714	13	1	WA 1067	13	1			
HG 715	14-15	1	WA 86678	13	1			
HG 718	14	1	YO 7049	13	1			
IS 52133	13	2	YO 711	13	1			
IS 715	13	3	YO 712	13	1			
NP 5232	13	1	YO 716	13	1			

SECTION XI — STANDARD PARTS LIST

PART NUMBER	NOMENCLATURE	TOTAL QUANTITY	ATTACHING QUANTITY
AN 3105-2	Nut, terminal	2	
AN 3105-3	Terminal, insulation	2	
AN 3105-6	Nut, outlet	2	
AN 935-416	Washer, lock	2	
AN 935-6	Washer, lock	2	

SECTION XII SPECIAL SERVICE TOOLS

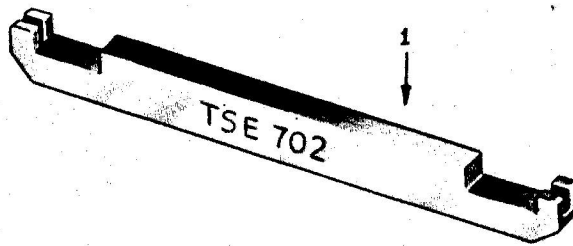


Figure 11 — Adjusting Tool

INDEX NO.	PART NO.	NOMENCLATURE
1	TSE 702	Adjusting Tool

Note

The above tool is supplied only as an Overhaul Tool and is not to be used as a Service Tool.

