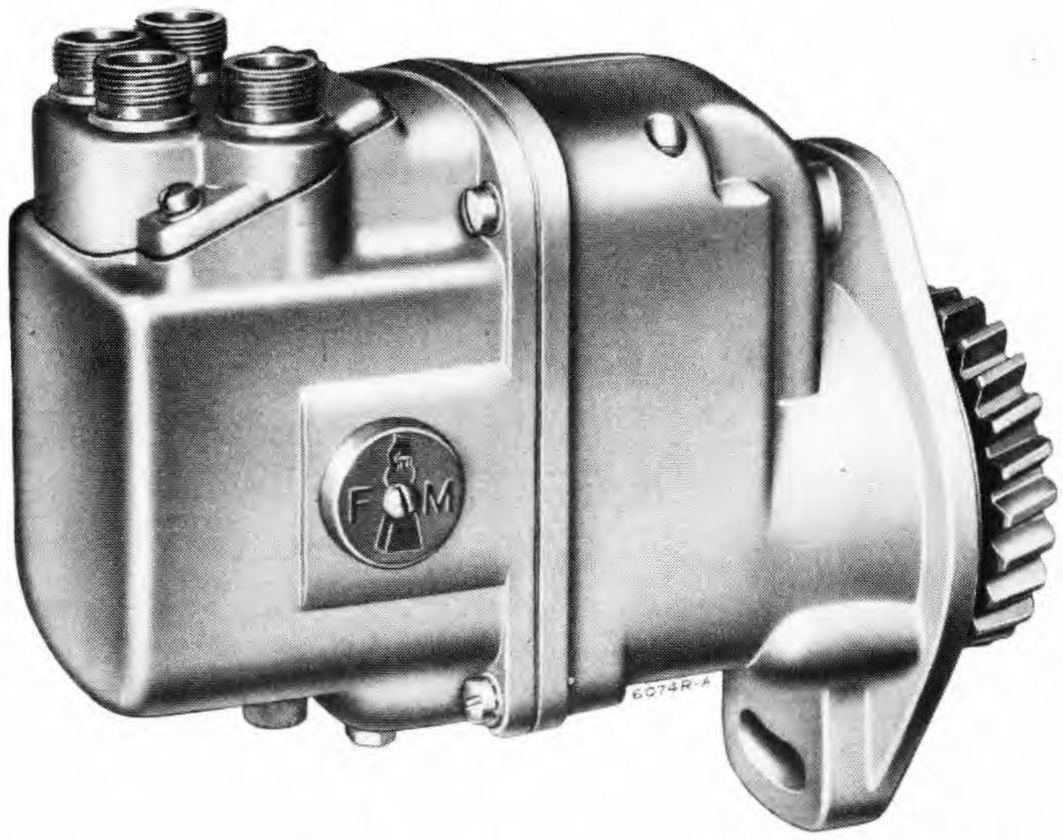
Instructions No. 2927A
Supersedes Instructions No. 2927

FAIRBANKS-MORSE

TYPE FM-XE4 RADIO-SHIELDED MAGNETOS

(Also Applies to Type FM-XFE2 Magnetos)



Field Service and Adjustment Information

SERVICE PROCEDURE

Improper functioning of the magneto is often believed to be the cause of much engine trouble arising from other sources, such as a flooded carburetor, an obstructed air intake, defective ignition connections, or corroded spark plug points. Since a brief engine inspection will often locate the trouble before the magneto is reached, it prevents maladjustment of magneto parts in good condition. It is suggested that the magneto be opened only when it is certain that the ignition spark produced is unsatisfactory.

TESTING THE IGNITION SPARK

With properly adjusted spark plugs in good condition, the ignition spark should be strong enough to bridge a short gap in addition to the actual spark plug discharge. This may be determined by removing the upper half of the spark plug radio shield and holding the ignition cable end not more than 1/16 in. away from the spark plug terminal. The engine should not misfire when this is done.

TESTING THE MAGNETO SPARK

Remove the cable outlet nuts to free the metal cable sheaths; then pull the cables out of the distributor block sockets. Refer to Fig. 1. Remove 1/2 in. of the insulation from the end of a short piece of stiff, rubber-covered wire and insert in place of the high-tension cable. Be sure this wire reaches the bottom of the socket and contacts the brass insert. Bend the other end of the wire to within 1/8 in. of the engine or magneto frame and watch closely for a spark between the wire and the engine (or magneto) frame when the engine is cranked slowly. Test each of the sockets in turn; if a strong spark is observed with the wire in each socket, it is recommended that the magneto be eliminated as the source of difficulty and that the cables, terminals, and spark plugs be thoroughly inspected. If no spark occurs, the ignition switch should be examined to make certain it has not accidentally become closed.

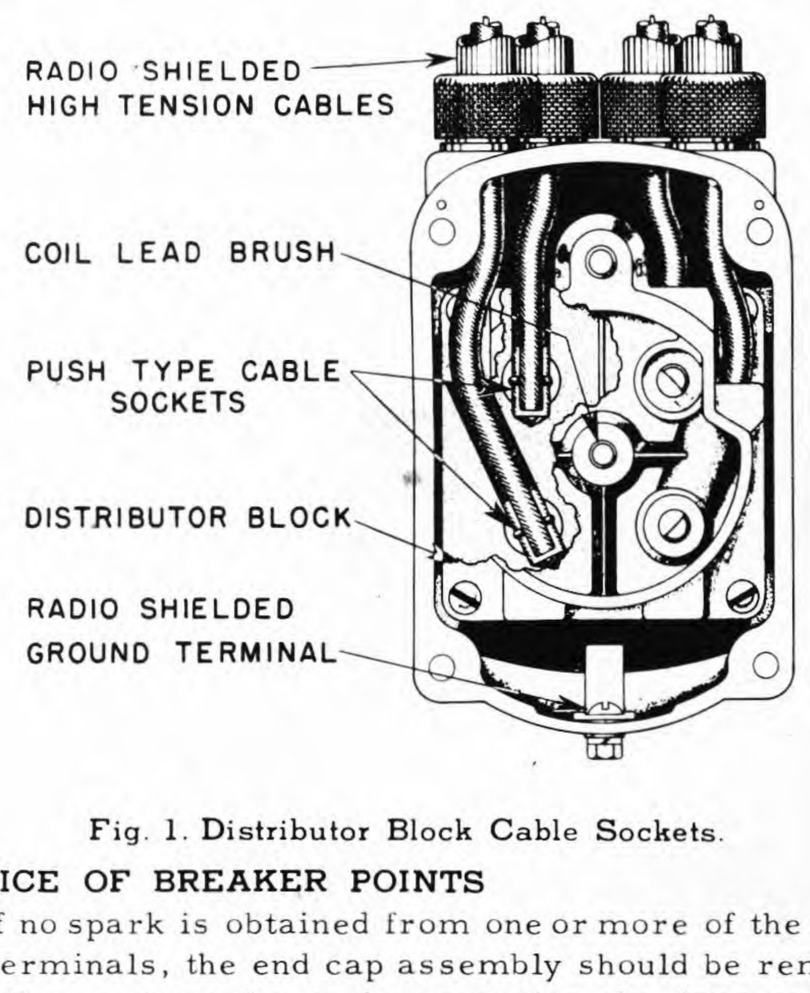


Fig. 1. Distributor Block Cable Sockets.

SERVICE OF BREAKER POINTS

If no spark is obtained from one or more of the magneto terminals, the end cap assembly should be removed from the magneto frame by removing the four end cap screws. Then examine the carbon brush in the center of the distributor block and replace it if noticeably worn or damaged. This brush should move freely in its holder and should be under slight spring pressure. Next, inspect the breaker points for evidence of pitting or pyramiding. A small tungsten file or fine stone may be used to resurface the points except in the case of badly worn or pitted points, which should be replaced. If it is necessary to resurface or replace the breaker points, it will also be necessary to adjust them to their proper clearance, which is 0.015 in. at full separation. This adjustment is made in the following manner: Loosen the contact support lock-

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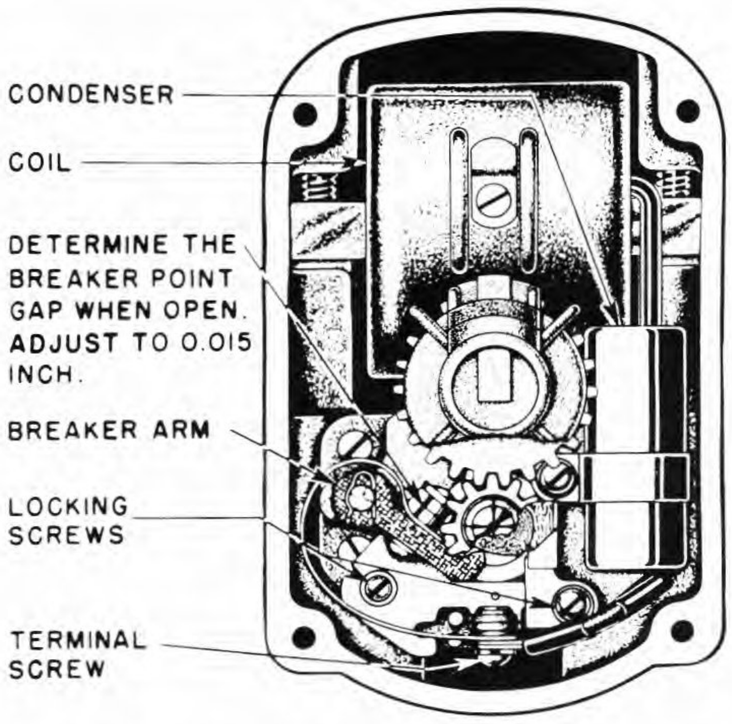


Fig. 2. End View of Type FM-X Magneto.

ing screws, identified in Fig. 2. Then move the contact support until the proper breaker point clearance is obtained. This is accomplished by means of a screwdriver inserted in the horizontal slot at the bottom of the contact support and pivoted between the two small bosses on the bearing support. Lock the assembly in place by tightening the locking screws, and take a final measurement of the breaker point gap after the locking screws are tightened.

FURTHER FIELD SERVICE NOT RECOMMENDED

The cam felt wick, if dry or hard, should be replaced by a new factory-impregnated wick. This is done by substituting a new cam wick and holder assembly for the old assembly. Other than this, Type FM-XE magnetos do not require field lubrication and any attempt to oil or grease the bearings is inadvisable. The lubricants should be renewed only during a complete overhaul of the magneto by a Factory-Authorized Magneto Service Station.

INTERNAL TIMING

Before mounting the end cap onto the frame, the rotation of the magneto must be determined; this can be quickly ascertained by referring to Fig. 3. Rotation is clockwise when the condenser is mounted to the right of the rotor and distributor gears and counterclockwise when mounted to the left. The breaker point assembly also changes its location, but for simplicity, this detail has been blocked out in the drawing. The gear teeth are marked to facilitate the internal timing of the magneto. For clockwise rotation the single marked tooth of the pinion must mesh between the two teeth of the distributor gear designated by the letter C. For counterclockwise rotation, the marked tooth of the pinion must mesh between the two teeth of the distributor gear designated by the letter A.

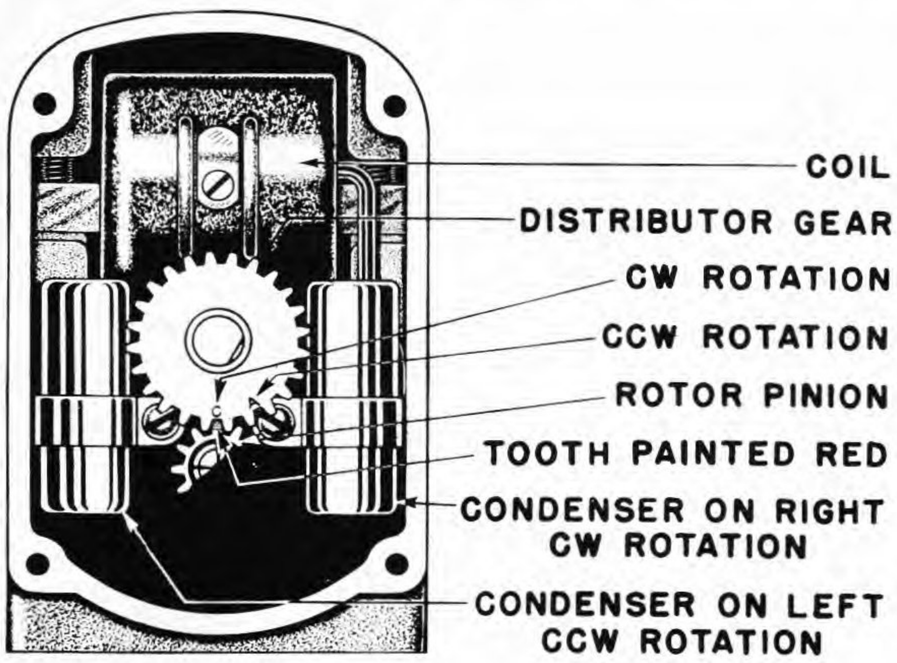


Fig. 3. Internal Timing of Type FM-XE4 Magneto.

SPECIAL DRIVE GEAR

The Type FM-XE4B8B magneto, as adapted to Climax and Waukesha ICK engines, is equipped with a special drive gear, mounted directly on the impulse coupling. The gear is a slip fit on the extended coupling nut, since movement of the gear with respect to the coupling nut (and rotor shaft) occurs during the impulse period. If the gear has been removed, it is necessary to exercise care in reassembly, since both gear and coupling are symmetrical. See Fig. 4.

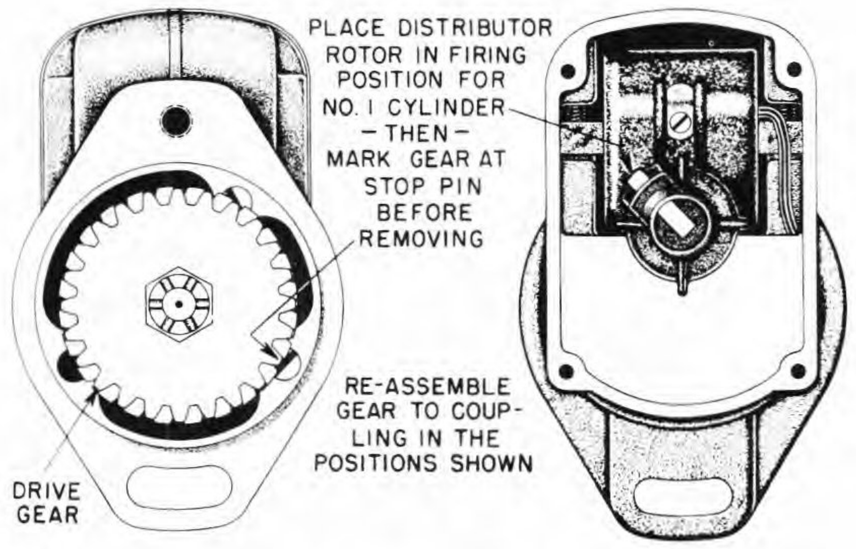


Fig. 4. Drive Gear Marking and Assembly.

TIMING MAGNETO TO ENGINE

Proper timing of the magneto to the engine produces an ignition spark in each cylinder at the exact instant that the fuel mixture should be ignited for best engine performance. This instant, which is accurately determined by the engine designers, is usually designated as a given number of degrees of angular travel of the crankshaft before the piston reaches its uppermost position in the cylinder during the compression stroke. Nearly all engines are marked to facilitate proper timing, but a close approximation may be obtained in the following manner: Crank the engine slowly until the piston in No. 1 cylinder is at top dead center on its compression stroke. Then,

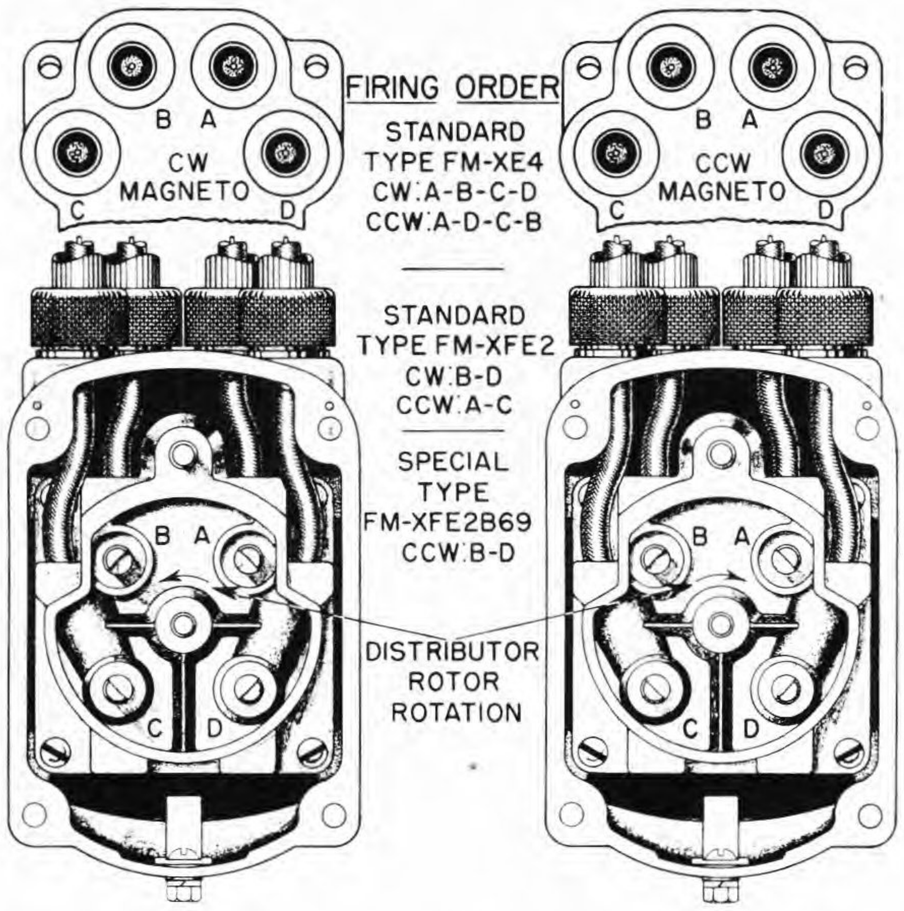


Fig. 5. Cable Outlets for Types FM-XFE2 and FM-XE4 Magnetos.

with the magneto end cap remounted on the frame, set the magneto for spark discharge to the No. 1 terminal, designated by the letter A in Fig. 5. This may be accomplished by use of a short, stiff piece of wire placed in the No. 1 socket and bent to within 1/8 in. of the magneto frame. Then turn the magneto rotor from the impulse coupling end in its normal direction of rotation until a spark is observed between the wire and the frame. Hold the coupling in the position in which the trip occurred.

COUPLING MAGNETO TO ENGINE

Without disturbing the setting of either magneto or engine as determined above, couple the magneto to the engine in the following manner:

(1) Flange Mounting Magnetos

Engage the drive lugs of the impulse coupling with the driving slots of the engine drive member. A slight movement of the engine flywheel may be necessary to secure accurate alignment. Tighten capscrews and nuts securely.

(2) Base Mounting Magnetos

If no change has been made in the position of the drive member, it is necessary only to engage the drive lugs of the impulse coupling with the drive slots of the float disc. Be sure that the shaft assembly is properly aligned before securing the base mounting screws.

ADJUSTABLE DRIVE MEMBERS

Most engines using base mounting magnetos are equipped with adjustable drive members. Ordinarily the position of the drive member is not altered when removing the magneto but when necessary, the drive collar nut L (See Fig. 6) can be loosened to permit relative movement of the engine drive shaft in collar K. The drive member slots J can then be turned for alignment with the impulse coupling lugs, after which the nut L should be tightened. The locking lugs M of the washer should be turned up around the nut to prevent its coming loose.

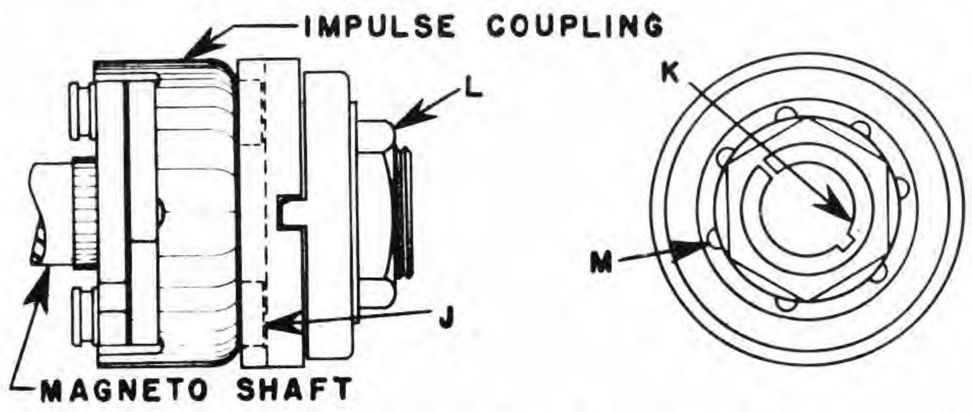


Fig. 6. Drive Member for Base Mounting Magnetos.

IMPULSE COUPLING

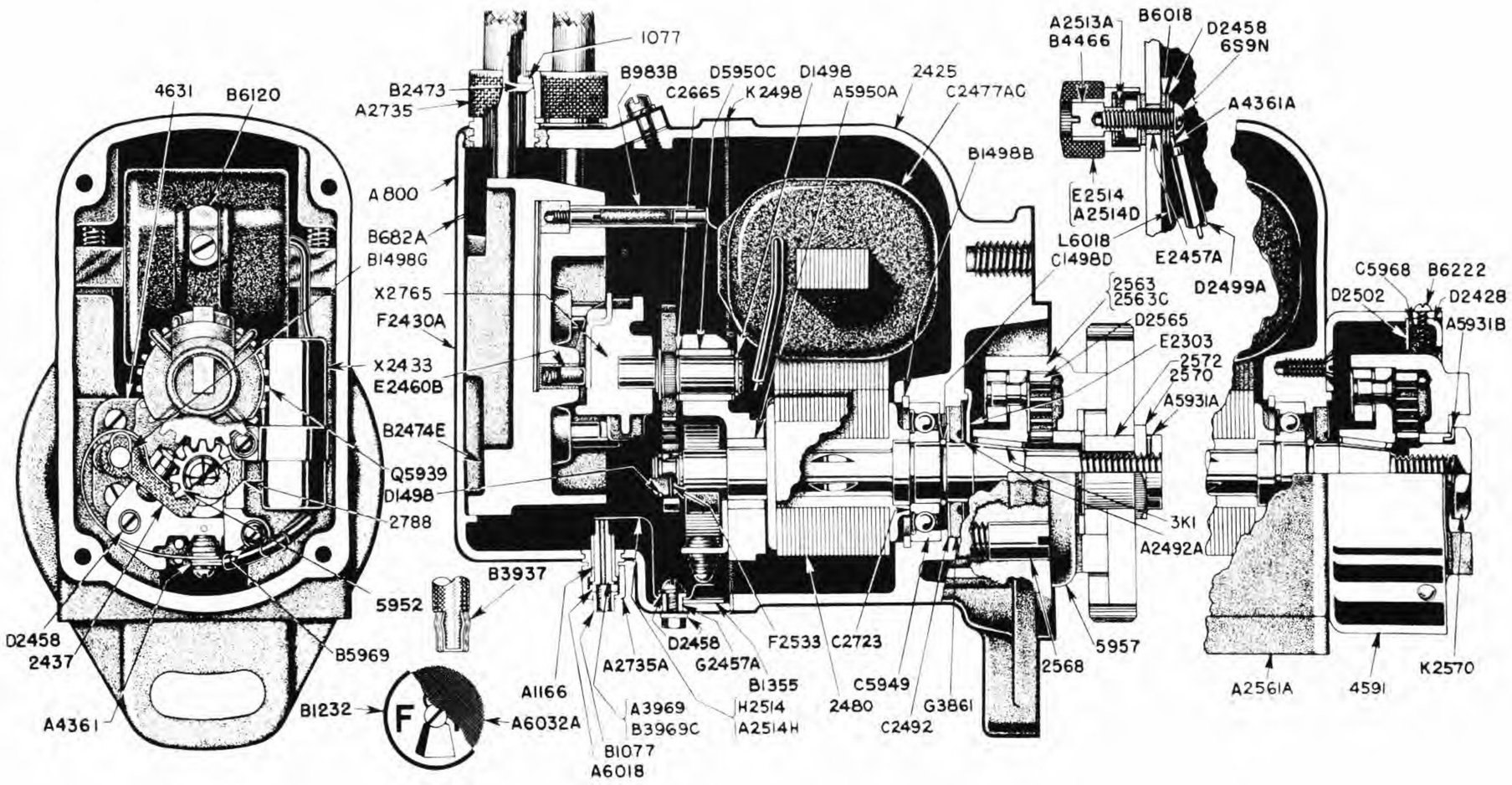
The impulse coupling is used to facilitate starting of the engine by automatically retarding the ignition spark during the starting operation and at the same time producing an intense, hot spark which would otherwise be impossible at very low engine speeds. By means of this device the rotor of the magneto is prevented from turning during the starting operation until the piston in the engine is approximately at top dead center, at which instant the rotor is snapped forward at very high speed, producing an intense spark which is automatically retarded to prevent backfiring. The impulse feature disengages as soon as the engine develops speed, after which the coupling serves as a conventional drive member. A characteristic snap as the impulse coupling releases usually indicates that it is functioning satisfactorily. The coupling may be cleaned in kerosene and lubricated with a medium engine oil, but if functioning improperly it should be taken, together with the magneto, to an Authorized Fairbanks-Morse Magneto Service Station.

MAGNETO SERVICE FACILITIES

Authorized Fairbanks-Morse Magneto Service Stations, located throughout the United States and foreign countries, have been carefully selected by Fairbanks, Morse & Co. to insure highly efficient and complete repair service to owners of Fairbanks-Morse magnetos. These service stations, which are specially equipped for magneto repair and manned by highly-trained personnel, maintain close contact with the factory service and engineering departments. The station most convenient may be located by use of Bulletin FM18D, which is available upon request.

Genuine Fairbanks-Morse magneto replacement parts, which may be obtained from all authorized service stations, should always be insisted upon for repairs. The use of spurious parts usually proves less satisfactory and economical, in addition to voiding the manufacturer's guaranty.

REPAIR CHART, TYPES FM-XFE2B69 & FM-XE4 MAGNETOS



Order by Part No.	Name of Part. Unless otherwise indicated, part is for both base and flange mounting, CW and CCW magnetos.	No. Used FM-XFE2B69	No. Used FM-XE4	Order by Part No.	Name of Part. Unless otherwise indicated, part is for both base and flange mounting, CW and CCW magnetos.	No. Used FM-XFE2B69	No. Used FM-XE4
B682A	End Cap Cover Gasket	1	1	6LW1	Primary Ground Screw Lockwasher	1	1
A800A	End Cap Cover	...	1	F2533	Rotor Gear Pin	1	1
A800B	End Cap Cover	1	...	A2561	Demountable Flange Plate	...	1
8S6D	End Cap Cover Screw (#8-32x3/8")	1	1	A2561A	Demountable Base Plate	...	1
8S8D	End Cap Cover Screw (#8-32x1/2")	2	2	AX2563	Impulse Coupling Hub Assembly (CCW)	1	...
B983B	High Tension Lead	1	1	HZ2563C	Impulse Coupling Complete (FM-XE4B16E)	...	1
B1077	Primary Ground Cable Ferrule	1	1	Q2563	Impulse Coupling Hub (CW,UA & UB)	...	1
B1077B	Spark Plug Cable Ferrule	2	...	Q2563C	Impulse Coupling Complete (CW, Flange)	...	1
L1077	Spark Plug Cable Ferrule	...	4	R2563	Impulse Coupling Hub (CCW, UA & UB)	...	1
A1166	Ground Cable Terminal Insulator	1	1	R2563C	Impulse Coupling Complete (CCW, Flange)	...	1
B1232	Vent Hood	2	2	RX2563C	Impulse Coupling Complete (Type UB14)	1	...
6S6N	Vent Hood Screw (#6-32x3/8")	2	2	T2563C	Impulse Coupling Complete (CW, Base)	...	1
B1355	Ground Terminal Strip Guide	1	1	U2563C	Impulse Coupling Complete (CCW, Base)	...	1
B1498B	Rotor Drive End Bearing Snap Ring	1	1	D2565	Impulse Coupling Drive Spring	1	1
B1498G	Fulcrum Pin Snap Ring	1	1	A2568	Impulse Coupling Stop Pin (Flange, CW)	...	1
C1498D	Rotor Drive End Shaft Snap Ring	1	1	B2568	Impulse Coupling Stop Pin (Flange, CCW)	1	1
D1498	Distributor Shaft Snap Ring	1	1	K2570	Impulse Coupling Nut	...	1
D1498	Rotor Gear Snap Ring	1	1	M2570	Impulse Coupling Nut	1	1
E2303	Oil Slinger Baffle Disc	1	1	R2570	Impulse Coupling Nut (FM-XE4B16E)	...	1
AX2425	Frame (Flange Mounting)	1	1	F2572	Impulse Coupling Gear Bushing	1	1
JZ2425	Frame (FM-XE4B16E)	...	1	G2572	Impulse Coupling Gear Bushing(FM-XE4B16E)	...	1
QX2425	Frame (Base Mounting)	...	1	C2665	Distributor Gear Thrust Washer	1	1
V2425	Frame (Use A2561 or A2561A Plates)	...	1	C2723	Rotor Drive End Bearing Shim (as needed)	2	2
D2428	Coupling Outer Shell Cupped Washer (Base)	...	1	A2735	Cable Outlet Nut	2	4
F2430A	End Cap and Vent Assembly	1	1	A2735A	Ground Cable Outlet Nut	1	1
10S10D	End Cap Screw (#10-24x5/8")	2	2	X2765	Distributor Rotor	1	1
10S18D	End Cap Screw (#10-24x1 1/8")	2	2	G2788	Cam Felt Wick & Holder Assembly (CW)	...	1
X2433	Condenser Assembly	1	1	H2788	Cam Felt Wick & Holder Assembly (CCW)	1	1
8S4U	Condenser Mounting Screw (#8-32x1/4")	1	1	G3861	Rotor Drive End Seal	1	1
W2437	Breaker Arm, Bracket & Points (CW)	...	1	A3969	Primary Ground Cable Terminal	1	1
X2437	Breaker Arm, Bracket & Points (CCW)	1	1	B3969C	Primary Ground Cable Terminal Group	1	1
6S5N	Breaker Arm Terminal Screw (#6-32x5/16")	1	1	A4361	Lead Wire Terminal for No. 8 Screw	2	2
6LW2	Breaker Arm Term. Screw Lockwasher (#6)	1	1	A4361A	Lead Wire Terminal for No. 6 Screw *	1	...
6S6N	Contact Support Locking Screw (#6-32x3/8")	1	1	B4466	Primary Ground Screw End Nut *	1	...
6LW2	Contact Support Locking Screw Lockwasher	1	1	B4591	Imp. Cplg. Outer Shell Assembly(Base,CCW)	...	1
8S6N	Contact Support Locking Screw (#8-32x3/8")	1	1	C4591	Imp. Cplg. Outer Shell Assembly(Base,CW)	...	1
8LW3	Contact Support Locking Screw Lockwasher	1	1	X4631	Bearing Support Assembly (CW)	...	1
E2457A	Primary Ground Screw Bushing *	1	...	Y4631	Bearing Support Assembly (CCW)	1	1
G2457A	Primary Ground Screw Bushing	1	1	8S6G	Bearing Support Screw (#8-32x3/8")	4	4
D2458	Contact Support Locking Screw Washer	1	1	A5931A	Impulse Cplg. Nut Lockwire(Gear Drive)	1	1
D2458	Primary Ground Screw Plate Washer	4	2	A5931B	Impulse Coupling Nut Lockwasher	...	1
E2460B	Coil Brush and Spring Assembly	1	1	Q5939	Distributor Gear Assembly	1	1
B2473	Cable Outlet Rubber Seal	2	4	C5949	Rotor Drive End Bearing	1	1
B2474E	Distributor Block	1	1	A5950A	Rotor Bearing, Opposite Drive End	1	1
8S8D	Distributor Block Screw (#8-32x1/8")	4	4	D5950C	Distributor Bearing	1	1
C2477A	Coil Assembly (Taped)	1	1	F5952	Magnetic Rotor Gear	...	1
C2477AC	Coil Assembly (Molded)	1	1	L5952	Magnetic Rotor Gear	1	...
25SS14A	Coil Bridge Setscrew (1/4-20x7/8")	2	2	DX5957	Impulse Coupling Shell	1	...
HW2480	Magnetic Rotor Assembly (FM-XE4B)	...	1	DY5957	Impulse Coupling Shell (FM-XE4B16E)	...	1
JW2480	Magnetic Rotor Assembly (FM-XE4B4)	...	1	M5957	Impulse Coupling Shell (CCW, Flange)	...	1
KW2480	Magnetic Rotor Assembly	1	...	N5957	Impulse Coupling Shell (CW, Flange)	...	1
MW2480	Magnetic Rotor Assembly (FM-XE4A)	...	1	P5957	Impulse Coupling Shell (CCW, Base)	...	1
RW2480	Magnetic Rotor Assembly (FM-XE4B16E)	...	1	Q5957	Impulse Coupling Shell (CW, Base)	...	1
A2492A	Rotor Drive End Seal Outer Washer	1	1	C5968	Imp. Cplg. Outer Shell Washer (Base)	...	1
C2492	Rotor Drive End Seal Inner Washer	1	1	B5969	Contact Support Locking Screw Washer	1	1
K2498	End Cap to Frame Gasket (Lead)	1	1	A6018	Ground Cable Insulator Washer	1	1
D2499A	Primary Terminal Wire Assembly *	1	...	B6018	Ground Cable Insulator Washer *	2	...
D2502	Imp. Cplg. Outer Shell Flat Washer (Base)	...	1	L6018	Ground Switch Terminal Insulator *	1	...
A2513A	Primary Ground Switch Button Spring *	1	...	A6032A	Vent Screen	2	2
A2514D	Primary Ground Switch Group *	1	...	B6120	Coil Clip	1	1
A2514H	Primary Ground Switch Group	...	1	6S3N	Coil Clip Screw (#6-32x3/16")	1	1
E2514	Primary Ground Switch Push Button *	1	...	6LW1	Coil Clip Screw Lockwasher (#6)	1	1
H2514	Primary Ground Strip	1	1	B6222	Coupling Outer Shell Screw (Base)	...	2
6S7N	Primary Ground Screw (#6-32x7/16")	1	1	25S6G	Cplg. Outer Shell to Frame Screw(Base)	...	4
6S9N	Primary Ground Screw (#6-32x9/16")	1	...	3K1	Key (Rotor to Impulse Coupling)	1	1
6N1	Primary Ground Nut (#6-32)	1	1				

*Special part for Type FM-XFE2B69A magneto.

FAIRBANKS, MORSE & CO.

Manufacturers

Executive Offices
Chicago, Illinois
313827-075308M-BDN
545835-075305M-BDN

Magneto Sales & Factory
Beloit, Wisconsin
Printed in U.S.A.