



Ural (Урал) - Днепр (Днепр) Russian Motorcycle Evolution

Part III: Ignition Systems

***(See Also Part I: Russian Engines, Part II: Russian
Generators/Alternators, Part IV: Russian Carburetors)***

***Ernie Franke
eafranke@tampabay.rr.com
6 / 2013***

Ignition Systems for Russian Motorcycles (Plotting the Migratory Course)







- We have seen different distributor/breakers ranging from the PM-05, manually controlled from a spark-advance lever on the left handlebar, to the automatic breaker PM-302, providing automatic change of ignition timing depending on engine speed. Modern, contact-less, electronic ignition migrated through Types I to Type V before arriving at the robust Ducati and Power Arc ignition systems. We have also seen a migration in ignition coils, starting with the KM-01 in the original M-72, and terminating with the distributor-less, compact units used in the electronic ignition systems.***
- Enclosed is a briefing where we tried to pull together a lot of information to make sense of this migration path.***
- Interestingly enough, one can almost identify the model and year of the Ural or Dnepr by the original electrical components. One notices that components (regulator, distributors/breakers, ignition coils and 6/12-Volt batteries) are usually paired together. Often one component may migrate faster than another component in the ignition system. This brought about a few mid-model changes.***
- I hope this information helps sort-out the ignition systems of heavy Russian motorcycles and I look forward to receiving helpful suggestions for further clarification and sources of more information.***

Outline of Ignition Study

- ***Association and Evolution of Ignition Components (Part I)***
- ***Manual Spark Advance (Part II): PM-05***
- ***Automatic Spark Advance (Part III): PM-302***
- ***Contact-Less (Electronic) Breaker Points (Part IV): Type I -to- Type V, Ducati, Power Arc and Powerdynamo Ignition Systems***
- ***Ignition (Induction) Coils (Part V)***
- ***Setting Timing on Manual, Automatic and Electronic Ignition Systems (Part VI)***

This study traces the evolution of the ignition system in the Russian motorcycle. We see automation (automatic spark advance/retard), low maintenance (contact-less breaker points) and optimization (ignition coil).

Russian Ignition Systems

- ***Breaker/Distributors***
 - ***Contact Systems***
 - ***PM-05: Manual Spark Advance /Retard***
 - ***PM-11 / PM-302 Breakers: Automatic Spark Advance***
 - ***Contact-Less (Electronic) Systems***
 - ***Type I - to - Type V Ignition Systems***
 - ***Ducati Ignition System***
 - ***Power Arc Ignition System***
 - ***Part V: Ignition Coils***
 - ***KM-01 Coil***  ***PM-05 Breaker/ Distributor***
 - ***IG-4048 Coil***  ***PM-05 Breaker/ Distributor***
 - ***B11 Coil***  ***PM-05 Breaker/ Distributor***
 - ***B2B Coil***  ***PM-05 Breaker/ Distributor***
 - ***B201 Coil***  ***PM-11 or PM-302 Breaker***
 - ***B204 Coil***  ***PM-302 / 302A Breaker***

Within each ignition system, each breaker / distributor is associated (paired) with a distinctive, corresponding ignition coil.

Table I: IMZ (ИМЗ) - Ural (Урал) Model/Year vs. Electrical System

Model	Year	Engine Size	Voltage	Generator/ Alternator	Regulator	Ignition Coil	Breaker/ Distributor	Battery
M-72	1941-56	750cc	6-Volt	G-11, G-11A (1952)	PP-1, PP-31 (1950)	KM-01, B2B, IG-4085B (1950)	PM-05	3MT-7 (7A-hr) or 3MT-14 (14A-hr)
M-72M	1956-60	750cc	6-Volt	G-11A (1952)	PP-31A	KM-01	PM-05	
M-72K	1951-58	750cc	6-Volt	*Magneto*	None	-	PM-05	None
M-61	1958-61	650cc	6-Volt	G-11A (1952)	PP-30, PP-31A (1956)	B11, KM-01	PM-05	3MT-12 (12A-hrs)
M-62	1961-65	650cc	6-Volt	G-414 (1957)	PP-31	B2B (1963)	PM-05	3MT-6 (6A-hrs) or 3MT-12 (12A-hrs)
					PP-302, PP-302A	B201, B201A	PM-302, PM-302A	
M-63 (Ural-2)	1965-71	650cc	6-Volt	G-414 (1957)	PP-302 (1963), PP-302A	B2B (1963)	PM-11A	
						B201, B201A	PM-302, PM-302A	
M-66 (Ural-3)	1971-73	650cc	6-Volt	G-414 (1957)	PP-302 (1963), PP-302A	B201, B201A	PM-302, PM-302A	
M-67	1974-76	650cc	12-Volt	G-424 (1974)	PP-302A, PP-330	B204	PM-302, PM-302A	6MTS-9 (9A-hrs) or 2X 3MT-6 (2X 6A-hrs)
M-67.36	1976-85	650cc	12-Volt	G-424 (1974)	PP-330, 33.3702 (1992)	B204	PM-302, PM-302A	
8.103 and 8.107 Series “650”	1984-98	650cc	12-Volt	G-424 (1974)	PP-330, 33.3702 (1992)	B204	PM-302A (1982)	6MTS-9 or 6CT-18-36A (18-to-36A-hrs)
						BC3 (BZ3) Contact-less Ignition System Type I (1994), II (1997), III (1998)		
8.103,8.103X, 8.123,8.123X 650 & 750 Series	1999- 2003	750cc	12-Volt	14.3771 (1998)	Internal to Alternator (YA212A11E)	Contact-less Ignition System Type IV (2002)		Varta YB18L
8.103,8.103X, 8.123,8.123X “750”Series	2004- present	750cc	12-Volt	Nippon Denso (2004)	Internal to Alternator	Type V (2004) Ducati (2006), Power Arc		6MTS-18, Interstate FAYTX-20HL

Notes:

1. M-64 (1961) and M-65 (1965) were prototypes.
2. Alternators progress in output voltage and power from Г-11 (G-11) generator of 6-Volts/45-Watts in 1941, Г-11A of 6 V/45 W in 1952, Г-414 6V/65 W in 1957, Г-424 of 12V/150W in 1974, 14.3771 of 12V/350W in 1998.5, to the present-day Nippon-Denso alternator of 12V/770W.
3. M-73 (1976) was an M-72 (750cc) with engageable sidecar wheel.
4. M-75 (1943) was experimental model with 500cc engine (6-Volt) on M-72 frame. M-76 (1947) was experimental (820cc).
5. Г-424 alternator (150 Watts) has external relay/regulator (PP-302 or PP-330). 14.3771 and Nippon Denso alternators have internal regulators.
6. 12-Volt ignition coil B2B (manual spark advance) paired with PM-05 distributor, B201/B201A (ignition coil for automatic spark advance) paired with PM-302/PM-302A. B2B and B201 coils for 6-Volts and B204 for 12-Volts.
7. PP-1, PP-30, PP-31 reverse-relay/voltage regulator for generator G-11/-11A systems were replaced with PP-302/-302A voltage regulator for G-414, and finally P-330 for the G-424 alternator.
8. 33.3702 Solid-State Voltage Regulator replaced the PP-330 in 1992.

Table II: KMZ (KM3) - Dnepr (Днепр) Model/Year vs. Electrical System

<i>Model</i>	<i>Year</i>	<i>Engine Size</i>	<i>Voltage</i>	<i>Generator/ Alternator</i>	<i>Regulator</i>	<i>Ignition Coil</i>	<i>Breaker/ Distributor</i>	<i>Battery</i>
<i>M-72</i>	<i>1951-56</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-11A (1952)</i>	<i>PP-31 (1950)</i>	<i>KM-01, B-2B</i>	<i>PM-05</i>	<i>3MT-7 (7A-hr) or 3MT-14 (14A-hr)</i>
<i>M-72N (H)</i>	<i>1956-60</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-11A (1952)</i>	<i>PP-31A (1956)</i>	<i>KM-01</i>	<i>PM-05</i>	
<i>K-750</i>	<i>1956-63</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-11A (1952)</i>	<i>PP-31A (1956)</i>	<i>IG-4085</i>	<i>PM-05, PM-11A</i>	<i>3MT-7, -10, -14</i>
	<i>1963-67</i>			<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>	<i>B2B (1963), B201</i>	<i>PM-302</i>	<i>3MT-12 or -14</i>
<i>K-750M</i>	<i>1963-77</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>	<i>B2B (1963)</i>	<i>PM-05</i>	<i>3MT-6</i>
						<i>B201</i>	<i>PM-302</i>	
<i>MT-12 (Dnepr-12)</i>	<i>1974-82 2WD 1982-85 1WD</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963), PP-302A</i>	<i>B2B (1963)</i>	<i>PM-05</i>	<i>3MT-12</i>
						<i>B201</i>	<i>PM-302</i>	
<i>MB-750</i>	<i>1964-73</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>	<i>B2B (1963)</i>	<i>PM-05</i>	<i>3MT-12</i>
						<i>B201</i>	<i>PM-301/PM-302</i>	
<i>MB-750M</i>	<i>1973-77</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963), 33.3702 (1992)</i>	<i>B2B (1963)</i>	<i>PM-05</i>	
						<i>B201</i>	<i>PM-302</i>	
<i>K-650/MT-8</i>	<i>1967-71</i>	<i>650cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963), PP-302A</i>	<i>B2B</i>	<i>PM-05, PM-11A</i>	<i>3MT-12</i>
						<i>B201</i>	<i>PM-302</i>	
<i>K-650/MT-9</i>	<i>1971-76</i>	<i>650cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963), PP-302A</i>	<i>B2B</i>	<i>PM-05</i>	<i>3MT-6 or 3MT-12</i>
						<i>B201A</i>	<i>PM-302</i>	
<i>MB-650</i>	<i>1976-84</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B204</i>	<i>PM-302, PM-302A(1982)</i>	<i>6MTS-9 or 2X 3MT-6</i>
<i>MB-650M1</i>	<i>1985-late 90s</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B204</i>	<i>PM-302A</i>	
<i>MT-10</i>	<i>1973-76</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B204</i>	<i>PM-302, PM-302A (1982)</i>	
<i>MT-10.36</i>	<i>1976-84</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B204</i>	<i>PM-302A (1982)</i>	
<i>MT-11 (Dnepr-11)</i>	<i>1984-2004</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330, 33.3702 (1992)</i>	<i>B204</i>	<i>PM-302A (1982)</i>	
<i>MT-16 (Dnepr-16)</i>	<i>1985-2005</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-30, PP-31, PP-330, 33.3702 (1992)</i>	<i>B201, B204</i>	<i>PM-302, PM-302A (1982)</i>	<i>6MTS-9 (9A-hr)</i>

Notes:

1. MT-14 (1977) was a prototype.
2. MB-650 is military version of MT-16 and MB-750 is a military version of the MT-12
3. Alternators progress in output voltage and power from Г-11 (G-11) generator of 6-Volts/45-Watts in 1941, Г-11A of 6 V/45 W in 1952, Г-414 6V/65 W in 1957, Г-424 of 12V/150W in 1974, 14.3771 of 12V/350W in 1998.5, to the present-day Nippon-Denso alternator of 12V/770W.
4. MT-11 and MT-16 remained in production until 1991 when they were re-named the Dnipro-11 (Dnepr-11) and Dnipro-16 (Dnepr-16).
5. Model #'s: H = N, MW = MB = MV
6. 33.3702 Solid-State Voltage Regulator replaced the PP-330 in 1992.
7. Г-424 alternator (150 Watts) has external relay/regulator (PP-302 or PP-330). 14.3771(350 Watts) alternator has internal regulator.
8. 12-Volt ignition coil B2B (manual spark advance) paired with PM-05 distributor, B201/B201A (ignition coil for automatic spark advance) paired with PM-302/PM-302A. B2B and B201 coils for 6-Volts and B204 for 12-Volts.

6-Volt Electrical Systems

Motorcycle

Ural: M-72, M-72M, M-61
Dnepr: M-72, M-72N



**Г-11/11А: 45 W
(1941/1952)**

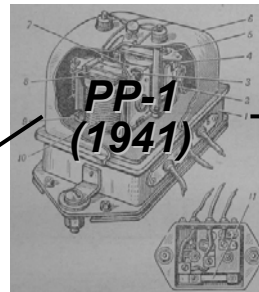
Ural: M-62, M-63, M-66
Dnepr: K-750, K-750M, MB-750,
MB-750M, K-650,
MT-9, MT-12



**Г-414: 65 W
(1957)**

Generator

Regulator



**PP-1
(1941)**



PP-30



**PP-31/PP-31A
(1950/1956)**



**PP-302/302A
(1963/197X)**

Ignition Coil



KIM-01



**IG-4085B (1950)
and B11**



B2B



B201/B201A

Breaker/Distributor



**PM-05
(1954)
(with manual
spark advance)**

**PM-11A
or
PM-301/PM-302/PM-302A
(with automatic spark
advance)**



12-Volt Electrical Systems

Motorcycle

Alternator

Regulator

Breaker - Ignition Coil

**Ural: M-67, M-67.36,
IMZ 8.103 Series
Dnepr: MB-650, MT-10,
MT-10.36, MT-11, MT-16**



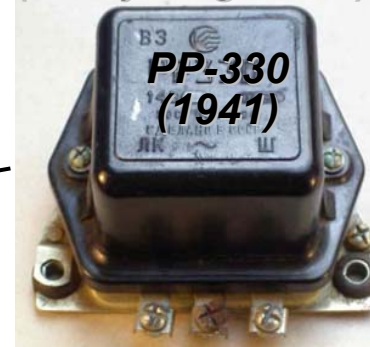
**Ural: IMZ 8.103 Series
(1999-2003)
Dnepr: None**



**Ural: IMZ 8.103 Series
(2004-present)
Dnepr: None**



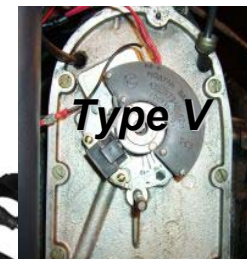
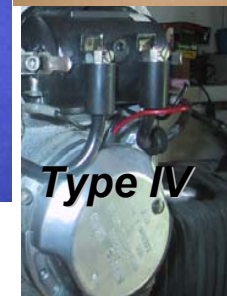
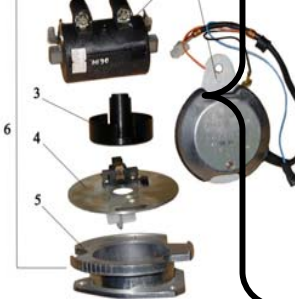
(Relay-Regulator)



**Internal to
Alternator**



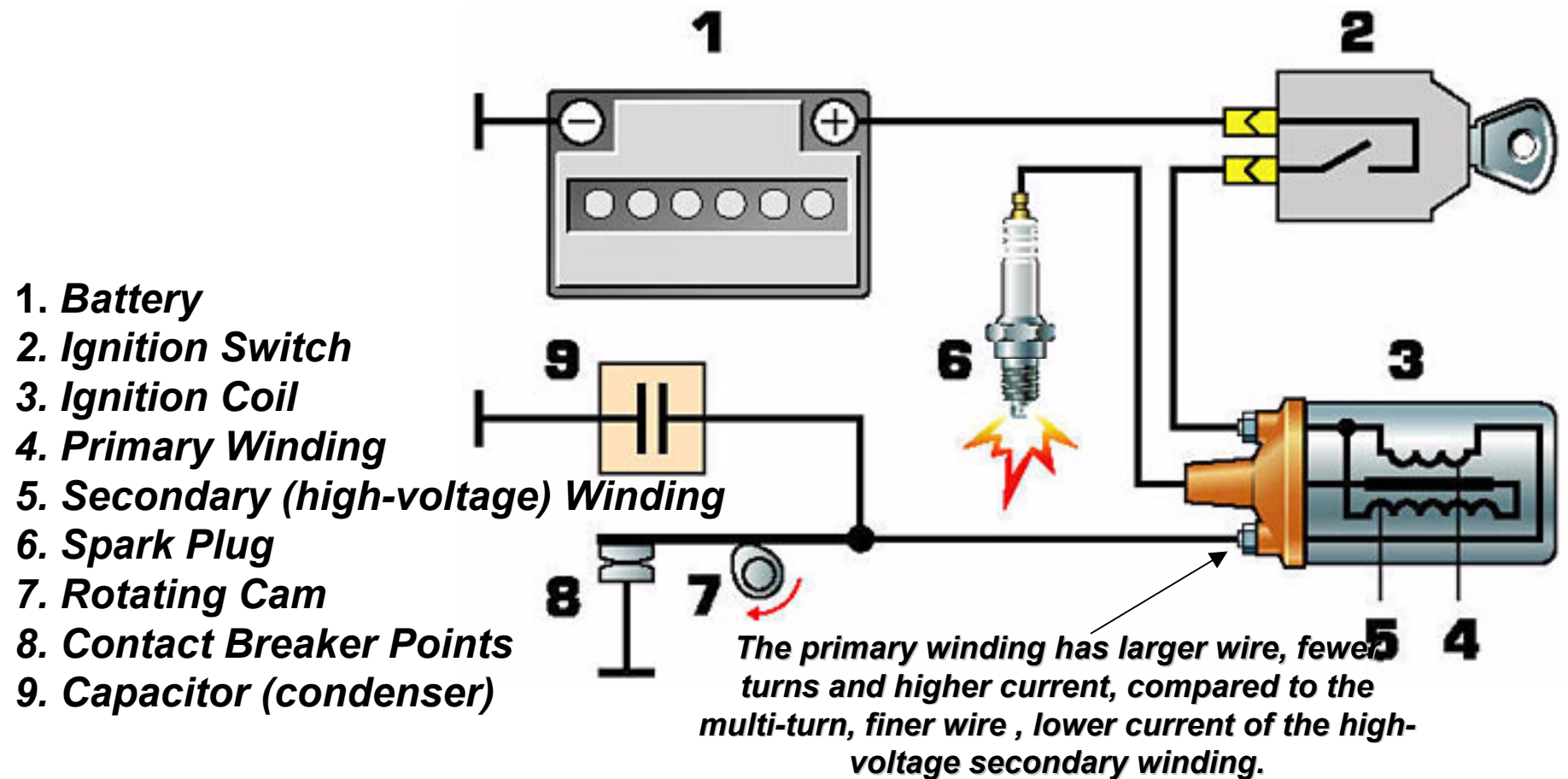
Contact-less



**Raceway Services
Power Arc**



Basic Ignition System



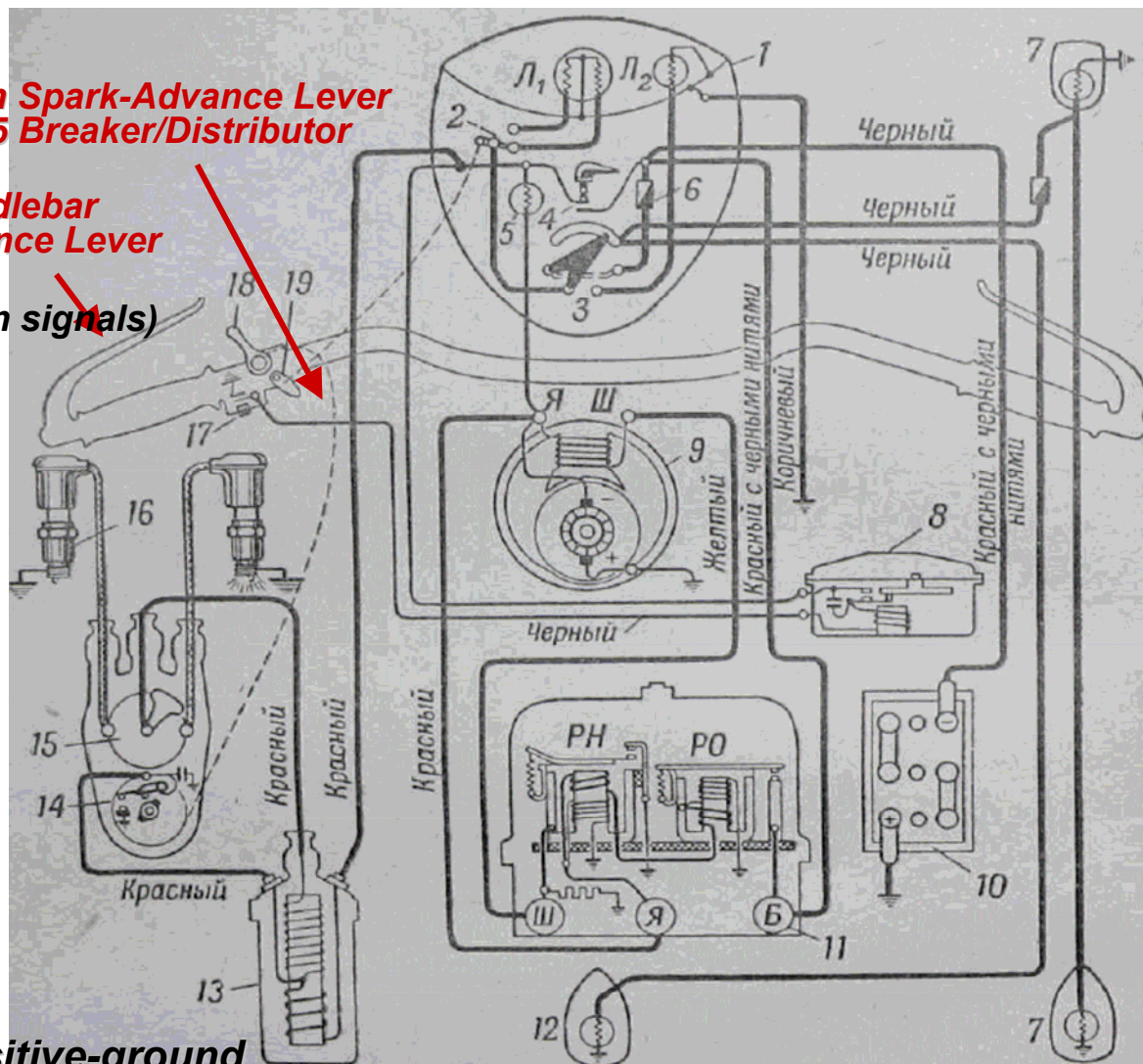
The basic ignition system is simple. The breaker points are normally closed, allowing the magnetic field to build in the ignition coil. When the cam shaft rises, opening the breaker points, the collapsing magnetic field induces a high-voltage in the secondary winding of the coil.

Basic Ural M-72 Ignition System

1. Headlight Cavity
2. Hi/Lo-Beam Switch
3. Central Switch
4. Ignition Switch
5. Charge Light
6. Safety Fuse
7. Sidecar Running Lamps (no turn signals)
8. Signal Horn
9. Generator (Г-11)
10. Battery
11. Relay Regulator (RR-1/PP-1)
12. Rear Bike Lamp
13. Ignition Coil
14. Breaker Points
15. Distributor
16. Spark (Candle) Plug
17. Horn Button Switch
18. Spark-Advance Lever
19. Hi/Lo-Beam Dimmer Lever

Cable from Spark-Advance Lever to PM-05 Breaker/Distributor

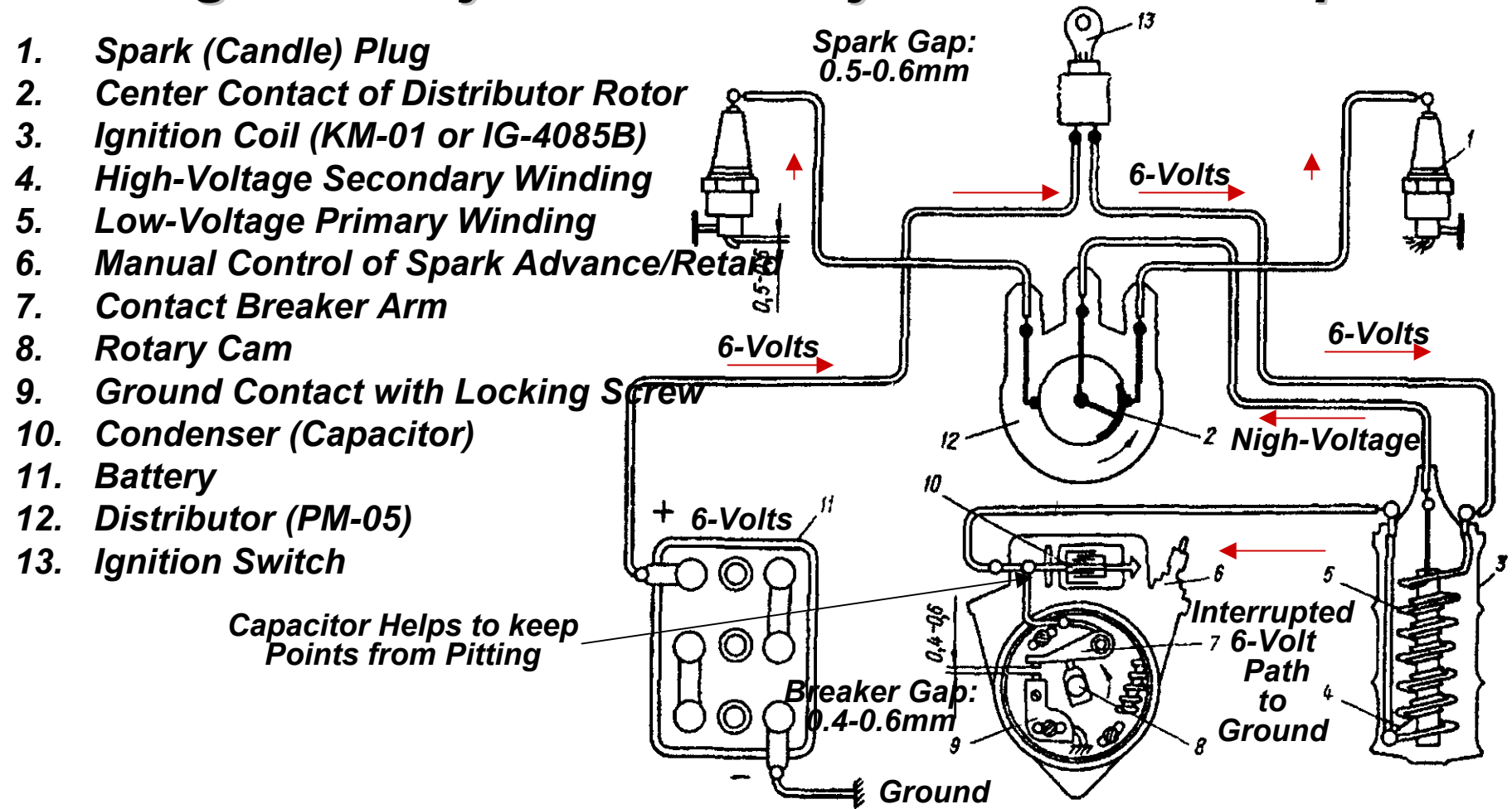
Left Handlebar Spark Advance Lever



Note: The early M-72's had positive-ground.

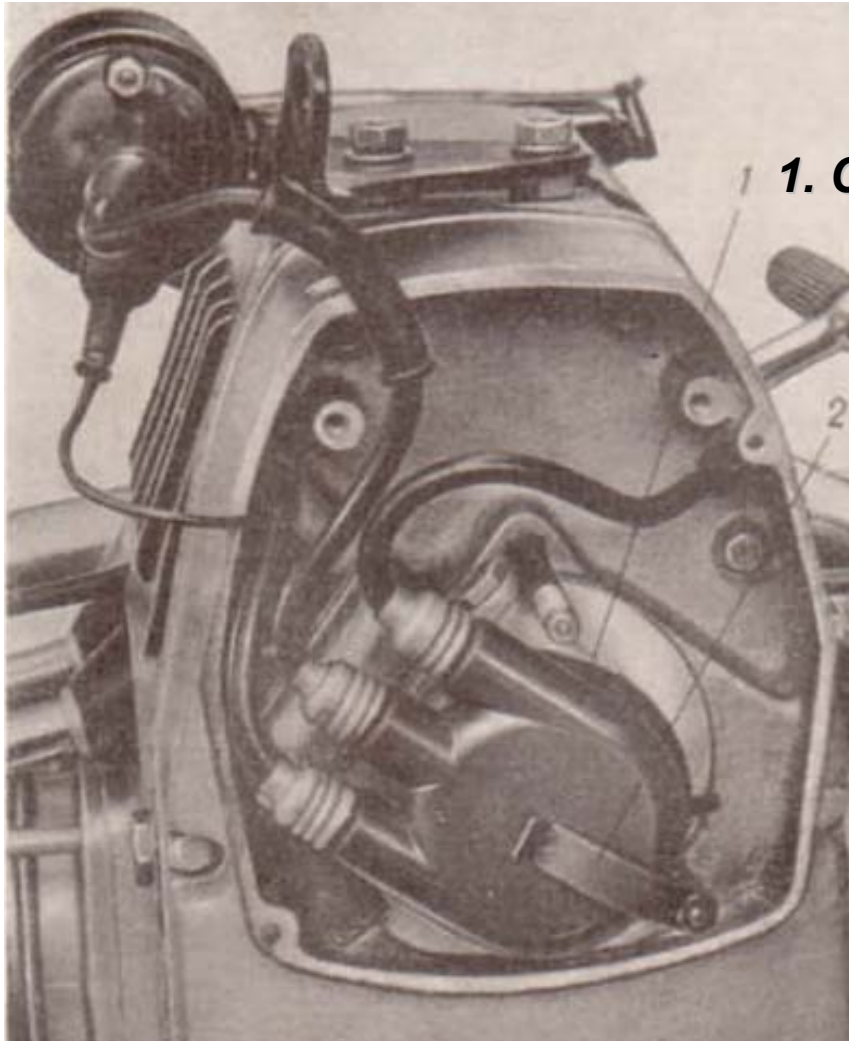
The same elements are shown in this drawing for the M-72, the first heavy Russian motorcycle. The spark advance lever is shown connected (dotted line) to the breaker/distributor.

Ignition System of Early Urals and Dneprs



The basic ignition system is simple. The breaker points are normally closed, allowing the magnetic field to build in the ignition coil. When the cam shaft rises, opening the breaker points, the collapsing magnetic field induces a high-voltage in the secondary winding of the coil.

PM-05 Breaker (Contact) / Distributor

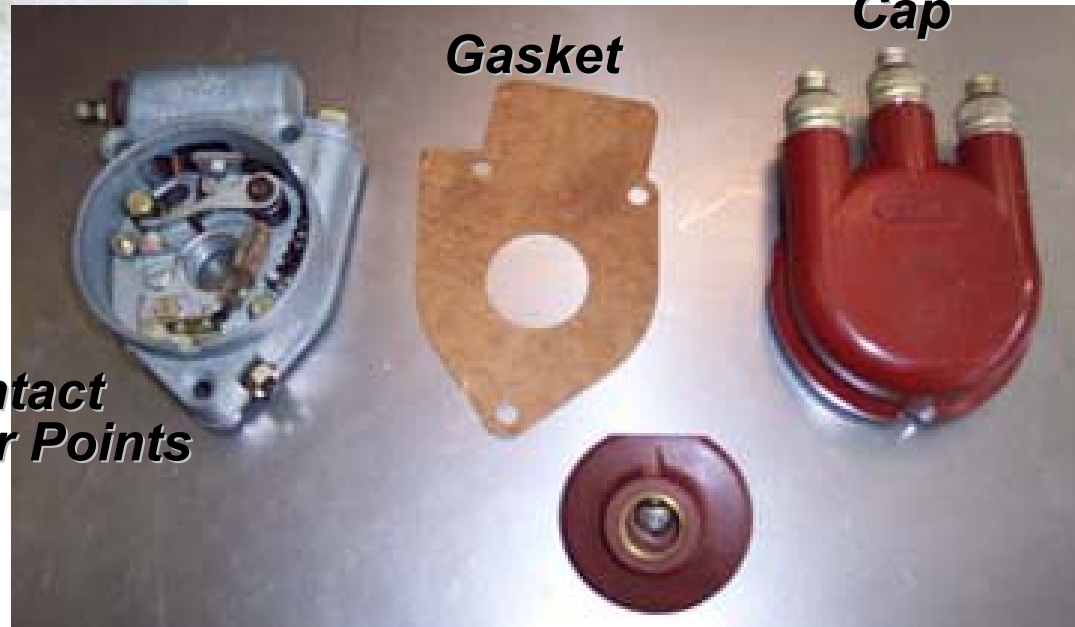
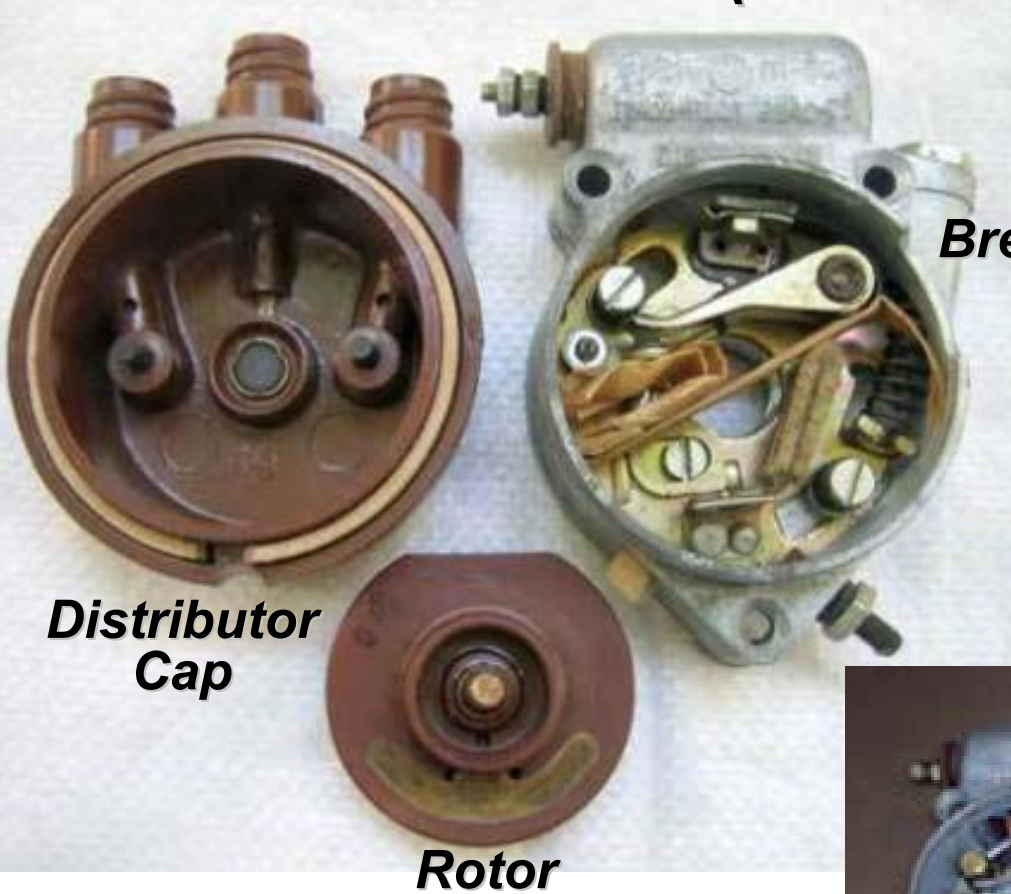


1. Circuit Breaker/Distributor

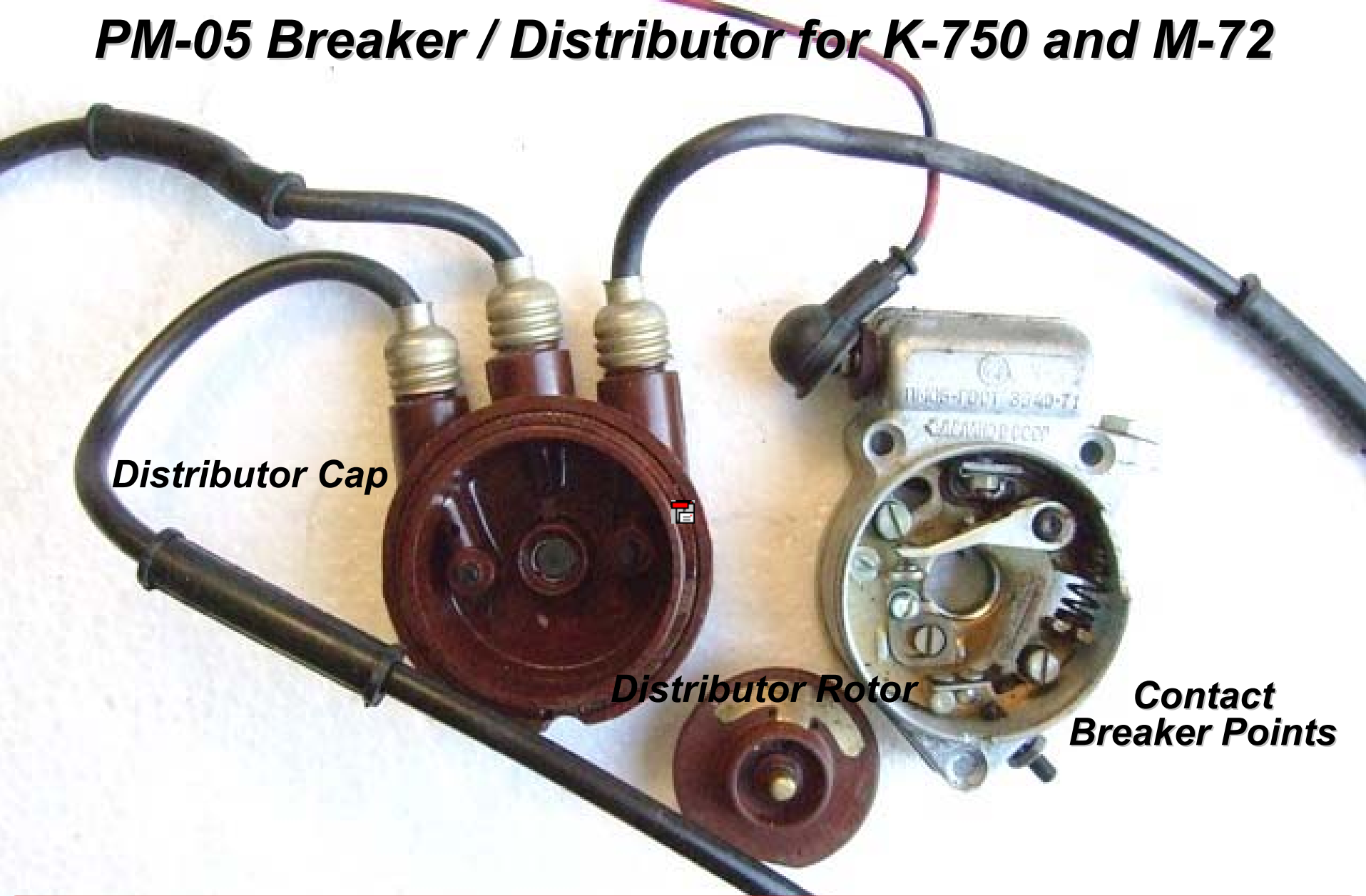
2. Attachment Spring

The PM-05 breaker/distributor was introduced to heavy Russian bikes on Ural's M-72. The distributor cap was fastened by a special spring. High-voltage travels from the middle contact to the spark plugs (candles).

Ignition Distributor PM-05 (6-Volt) for K-750, M-72 (Part# 72172)



PM-05 Breaker / Distributor for K-750 and M-72



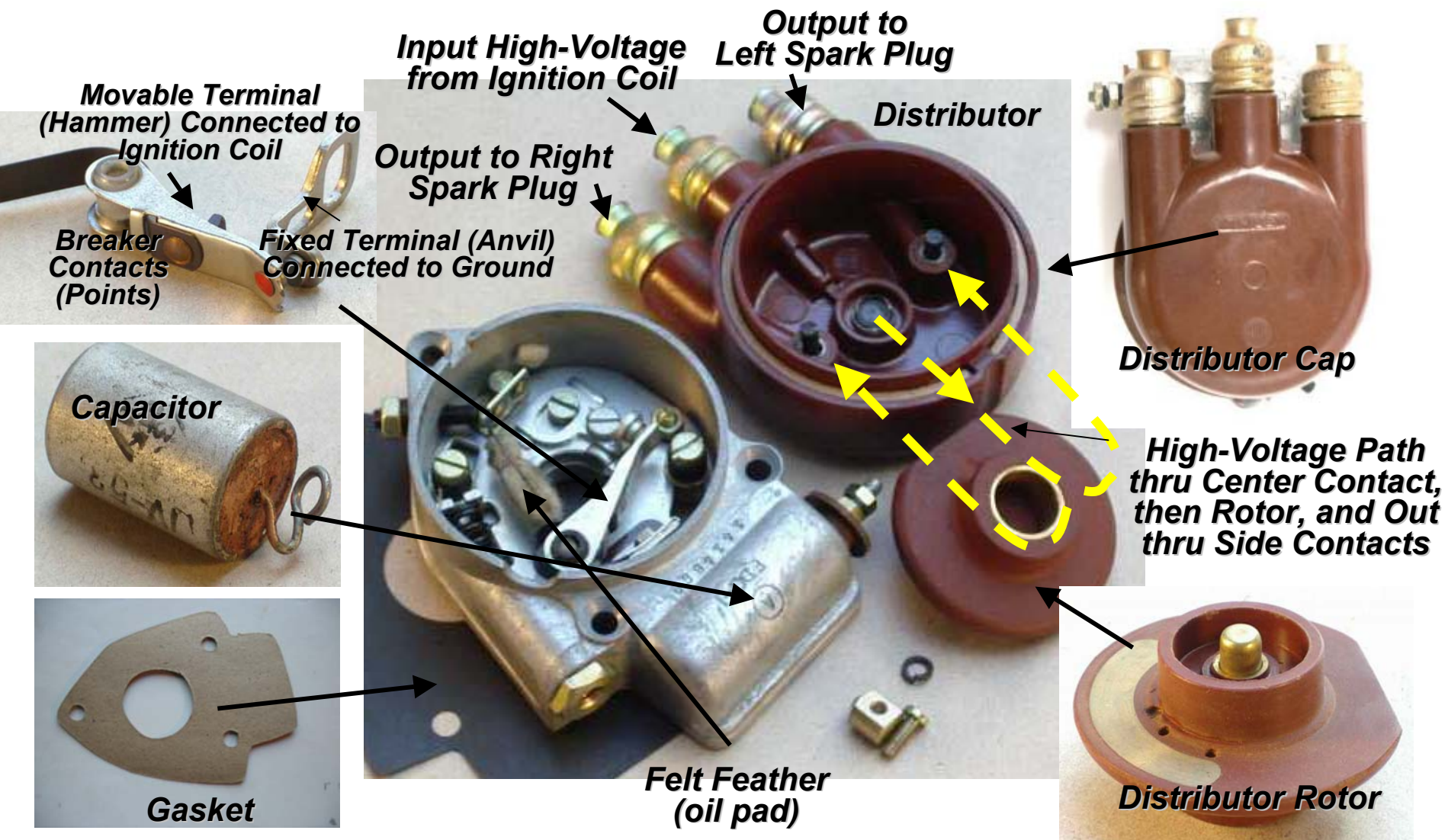
Distributor Cap

Distributor Rotor

***Contact
Breaker Points***

The vast majority of SV 750 cm³ engines have the manual spark-advance PM-05, where the angle is varied from late (0°-4°) to early (28°-32°) before TDC.

Breaker/Distributor PM-05 Breakdown



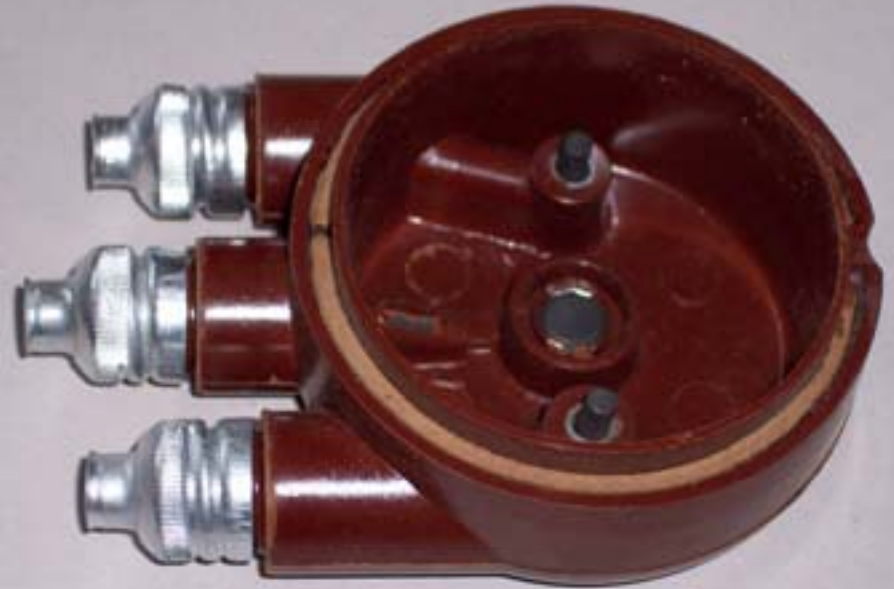
PM05 Breaker/Distributor was used on early versions of Dnepr's K-650, K-750, MT-12, MB-750 and M-72.

PM-05 Distributor Cover (Cap) and Rotor

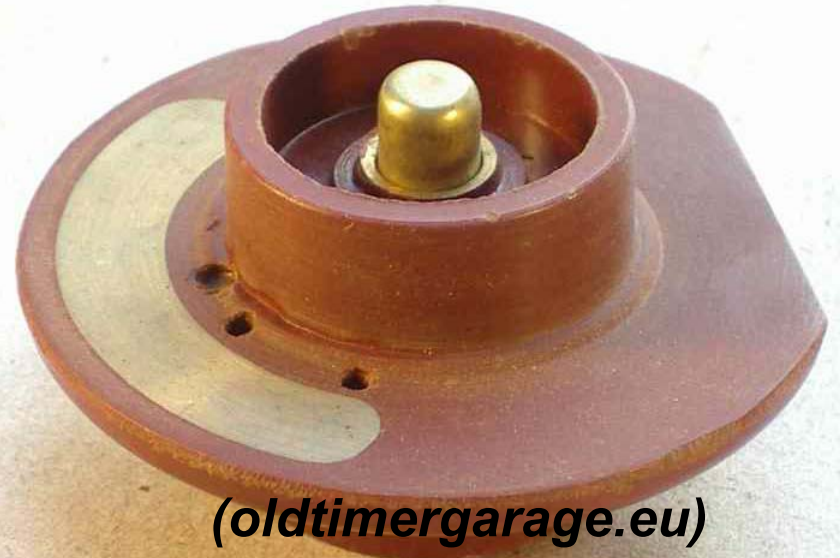
oldtimergarage.eu 000.927



ural-hamburg.de

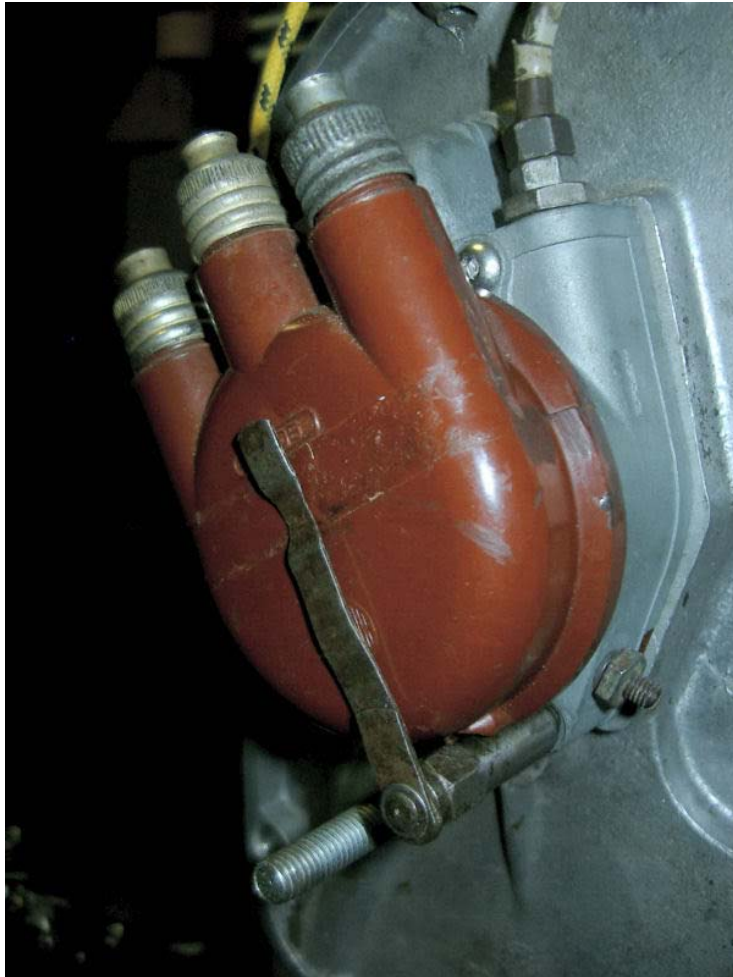


www.ural-hamburg.de



oldtimergarage.eu

PM-05 Distributor Cap Springs (Catweazle)



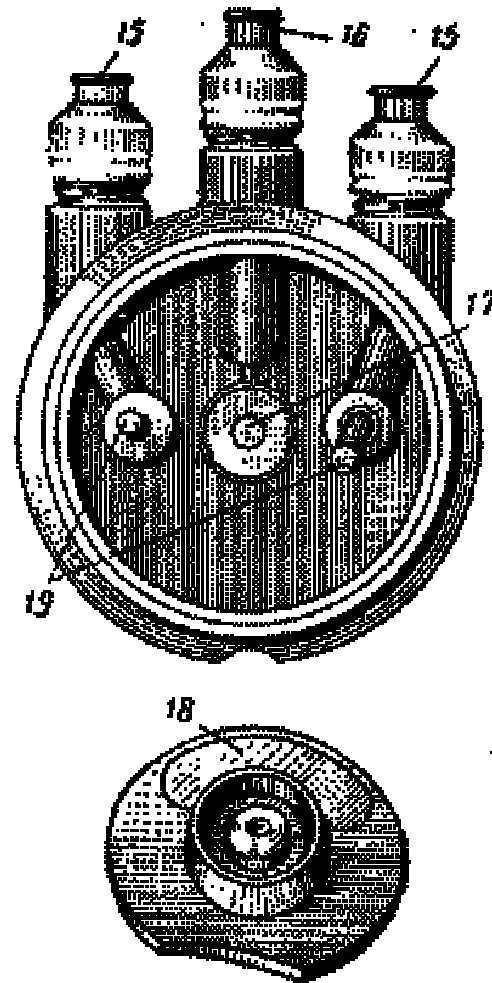
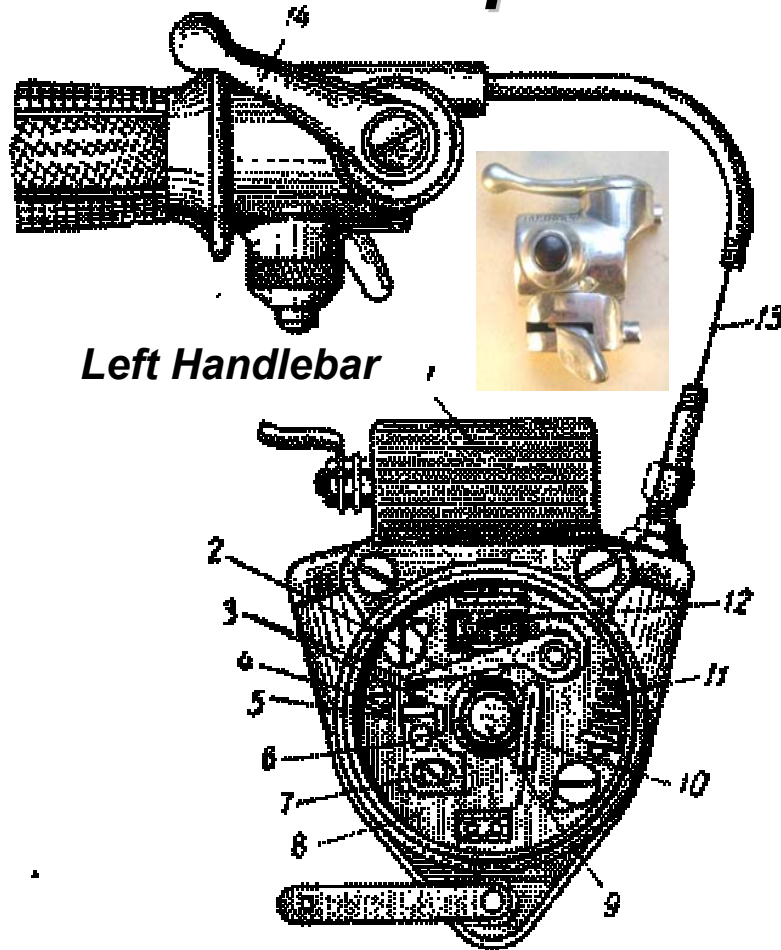
Older Type Cap



Newer Type Cap

***The clamping spring may be of a different length,
depending on the year of the bike.***

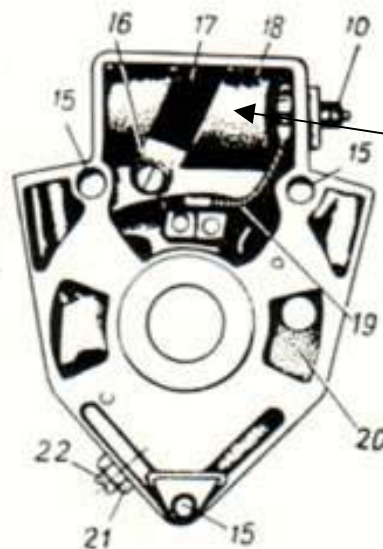
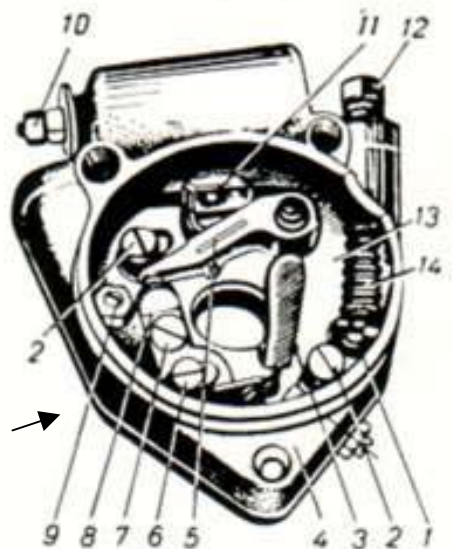
Manual Spark Advance M-61, K-750 and M-72



1. Capacitor
2. Movable Contact
3. Breaker Gap
4. Fixed Contact to Ground
5. Ground Contact
6. Locking Screw
7. Gap Adjustment Screw
8. Rotating Plate
9. Cam Shaft
10. Cam Roller
11. Spring
12. Anvil
13. Advance Control Cable
14. Advance Lever Control
15. Output to Spark Plugs
16. Input from Ignition Coil
17. Central Contact
18. Contact Plate
19. Carbon Contacts to Spark Plugs

The PM-05 breaker/ distributor, with manual ignition advance, consists of a body with a cap, breaker points riding on a cam, and two screws to allow rotation around an angle, which can be set for timing. The movable contact can be moved to regulate the gap, with the help of the eccentric adjusting screw.

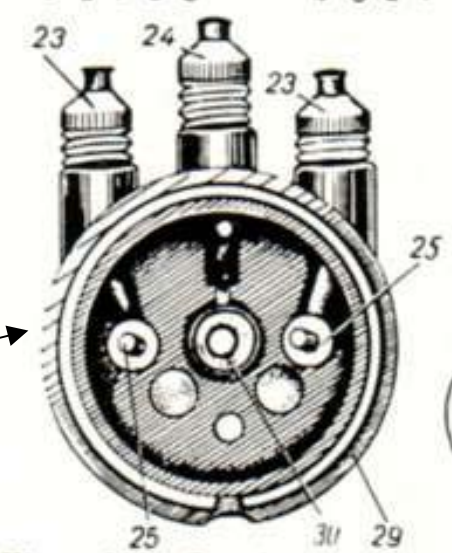
PM-05 Manual Advance/Retard Distributor



Capacitor



Rotary Disk



Distributor Cap

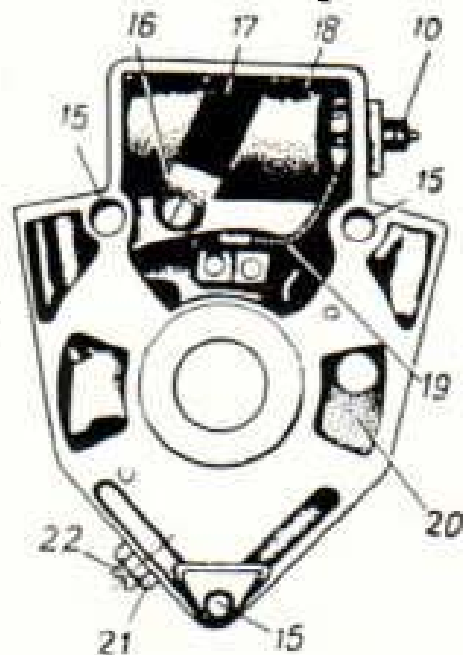
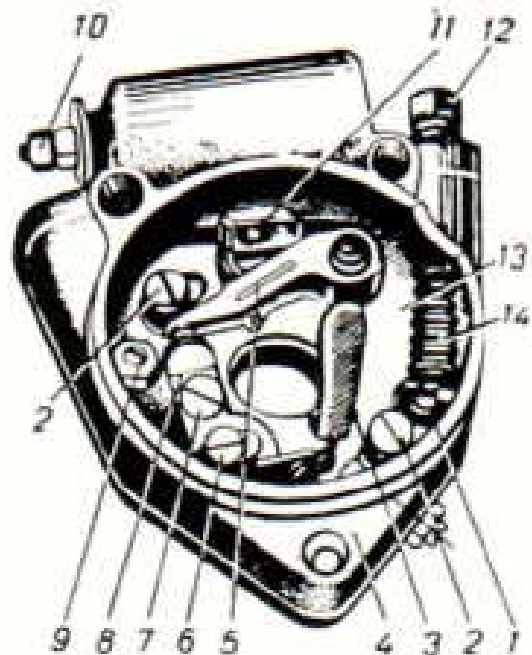


Rotor

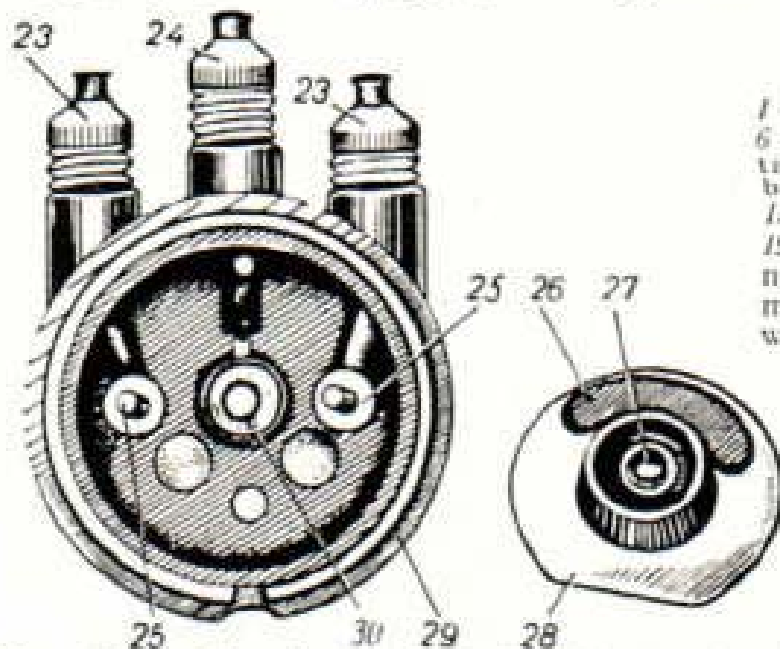
1. Stop
2. Screw
3. Oil Felt Pad
4. Body
5. Lever
6. Screw
7. Locking Screw
8. Interrupter Plate Contact
9. Eccentric
10. Insulated Terminal
11. Contact Bracket
12. Adjusting Stop
13. Rotary Disk
14. Spring
15. Screw Hole
16. Screw
17. Plate
18. Capacitor (Condenser)
19. Capacitor Wire
20. Cut-out in Body
21. Adjusting Screw Lock-Nut
22. Adjusting Screw
- 23./24. Wire Conduits
25. Carbon Contact
26. Contact Plate
27. Cap with Spring
28. Rotor
29. Cover with Contacts
30. Central Contact

The PM05 is controlled by the ignition lever on the left handlebar, while the later PM-302 centrifugal regulator, provided an automatic change of ignition timing depending on engine speed.

PM-05 Interrupter-Distributor

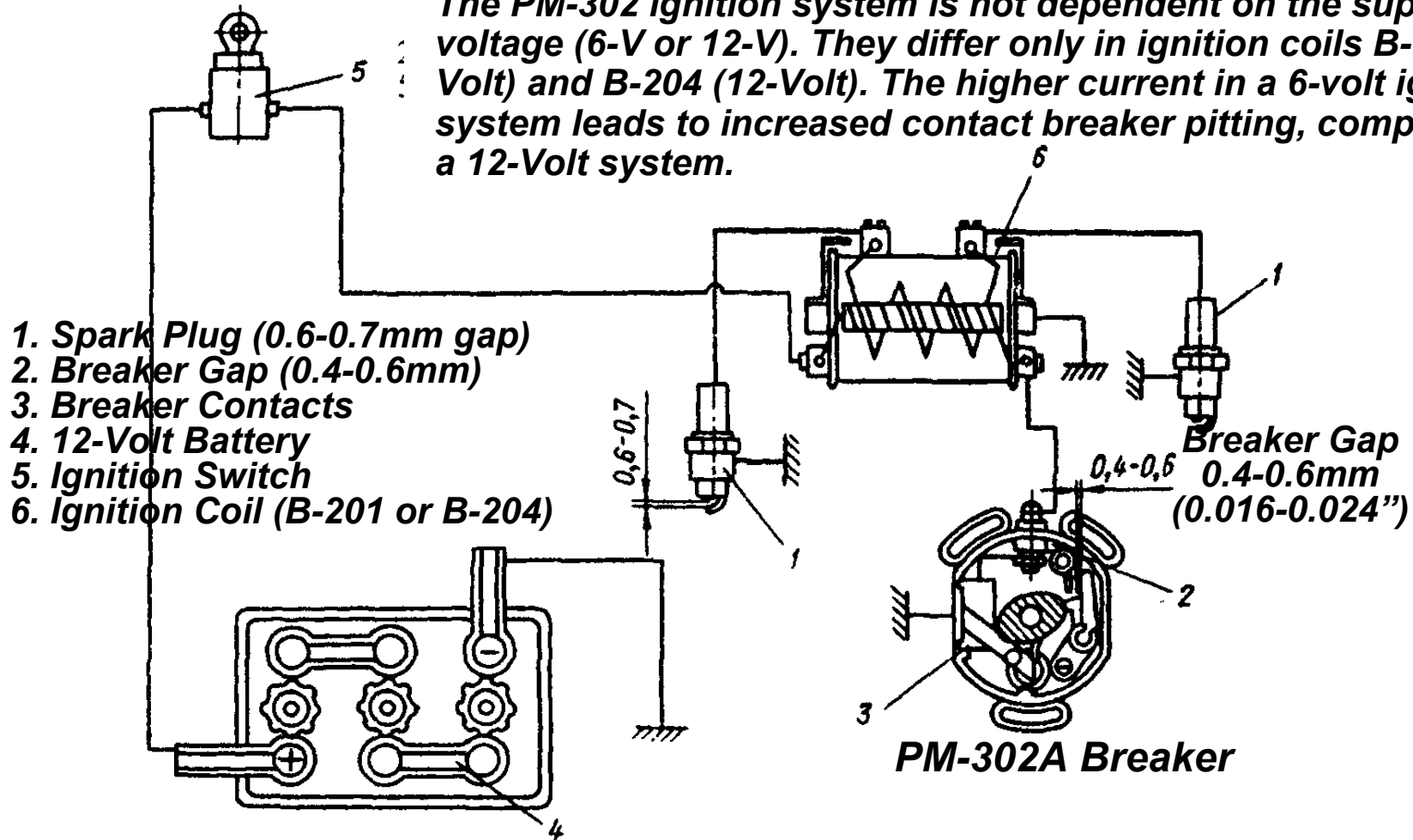


1 — stop; 2 — screw; 3 — oil felt pad; 4 — body; 5 — lever; 6 — screw; 7 — locking screw; 8 — interrupter plate contact; 9 — eccentric; 10 — insulated terminal; 11 — contact bracket; 12 — adjusting stop; 13 — rotary disk; 14 — spring; 15 — screw hole; 16 — screw; 17 — plate; 18 — capacitor; 19 — wire; 20 — cutout in body; 21 — adjusting screw lock nut; 22 — adjusting screw; 23 and 24 — wire conduits (terminals); 25 — carbon contact; 26 — contact plate; 27 — cap with spring; 28 — rotor; 29 — cover with contacts; 30 — central contact



PM-11 and PM-302A Breaker Systems

The PM-302 ignition system is not dependent on the supply voltage (6-V or 12-V). They differ only in ignition coils B-201 (6-Volt) and B-204 (12-Volt). The higher current in a 6-volt ignition system leads to increased contact breaker pitting, compared with a 12-Volt system.



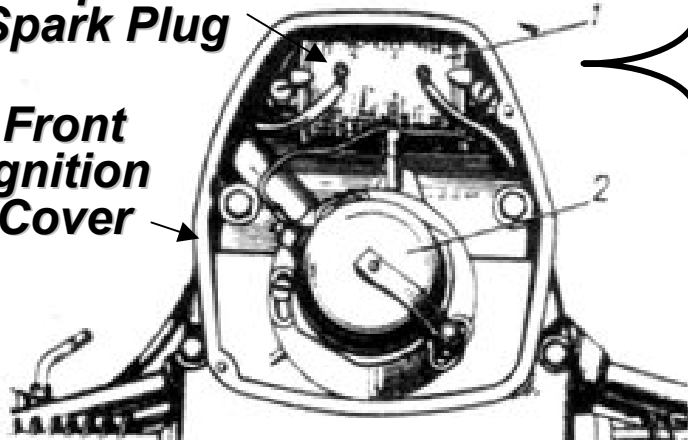
The basic ignition system is simple. The breaker points are normally closed, allowing the magnetic field to build in the ignition coil. When the cam shaft rises, opening the breaker points, the collapsing magnetic field induces a high-voltage in the secondary winding of the coil.

Breaker PM-302 and Ignition Coil B204

- Dnepr MT-10.36 / MT-11 / MT-16 and Ural M-62 / M-63 / M-66 / M-67**

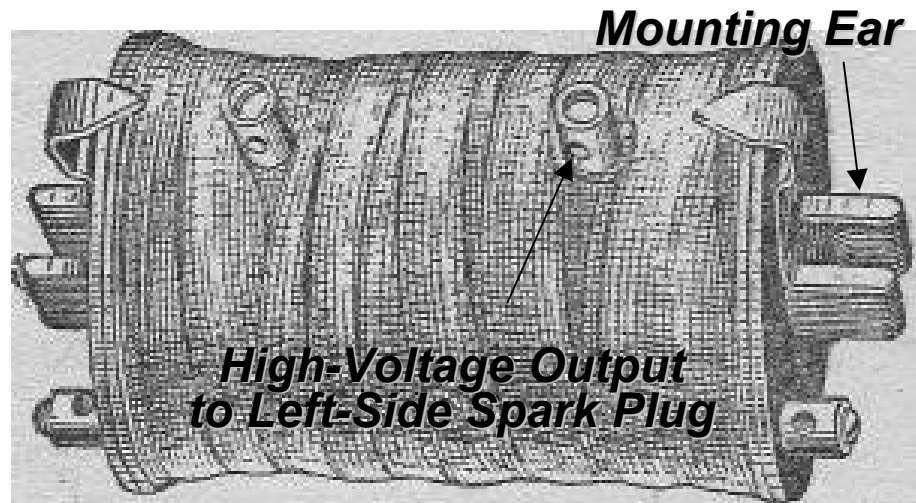
**High-Tension
Output to
Spark Plug**

**Front
Ignition
Cover**



- B204 Ignition Coil**
- PM-302A (IIM-302A) Breaker Unit**

**Low-Voltage
Primary Terminal**



The introduction of the PM-301/PM-302 breaker system eliminated any need for a distributor and provided automatic spark advance/retard. The centrifugal breaker points automatically adjusted to engine rpm's. The output of the ignition coil was connected directly to each of the spark plugs.

PM-302A (ПМ302А)

**12-Volt Breaker for Dnepr (MT-10.36/ MT-11/ MT-12/ MT-16)
and Ural (M-62/ M-63/ M-66/ M-67/ M-67.36/ Tourist)**

**Used with Ignition coil
B201A 6-Volt) or B204 (12-Volt)**



Breaker Points



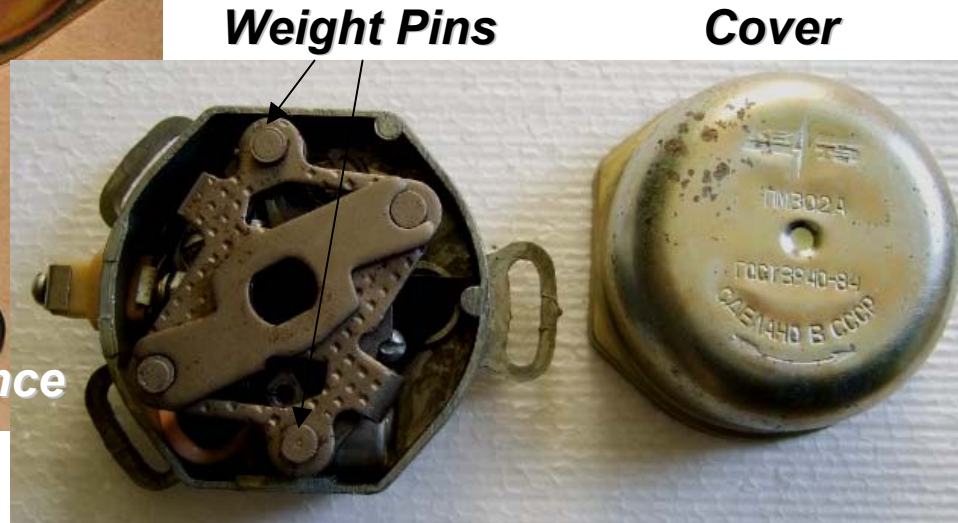
Cover



Carrier



Centrifugal Advance

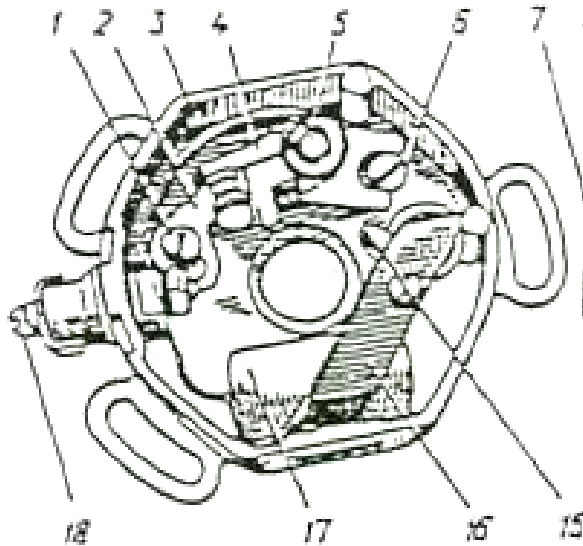


Weight Pins

The PM-302 ushered in the era of automatic spark advance with the introduction of the centrifugal advance/retard, consisting of breaker points, condenser, advance weights and springs, and earned the nick-name "the mixing bowl of doom."

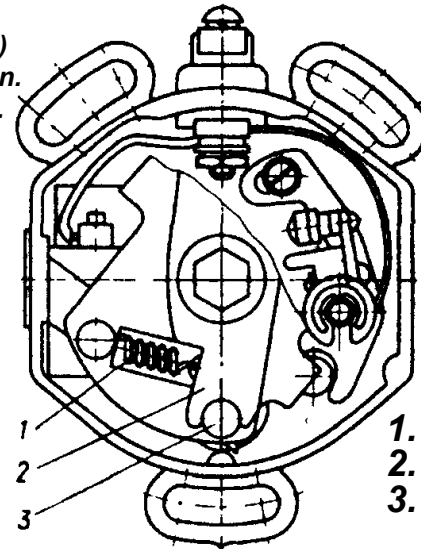
PM-302A Breaker with Automatic Spark Advance

To Adjust Gap: Undo screw fastening the automatic park timer. Slacken stop screw (1) and turn eccentric screw (6) in either direction. Set breaker gap to 0.4-0.6mm (0.016-0.024"). Tighten stop screw. Recheck gap.

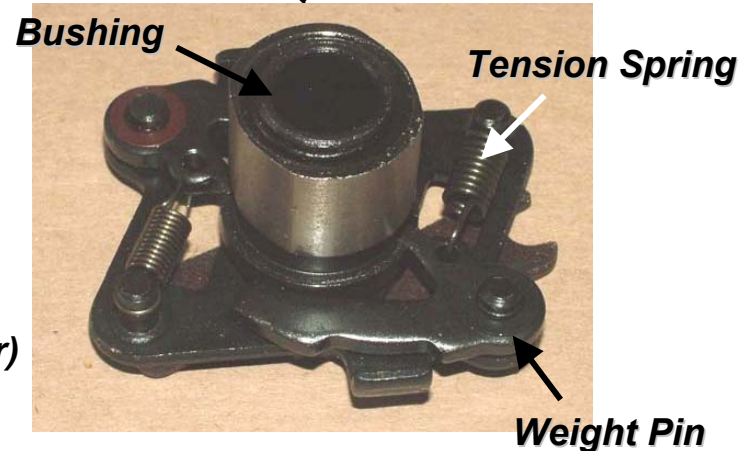


1. Stop Screw
2. Contact Leg
3. Breaker Body
4. Breaker's Lever
5. Lever Pin
6. Eccentric
7. Automatic Spark Timer
8. Weight Pin
9. Bushing

10. Spring
11. Carrier
12. Locking Ring
13. Cam
14. Weight
15. Lubrication Wick
16. Capacitor Holder
17. Condenser (Capacitor)
18. Terminal



1. Spring
2. Carrier
3. Weight Pin



Spark-advance is determined by the relationship between rotary speed (centrifugal force) and the tension spring. The correct placement of the two-piece advance unit's top plate is a rectangular opening at each side of the mounting bolt.

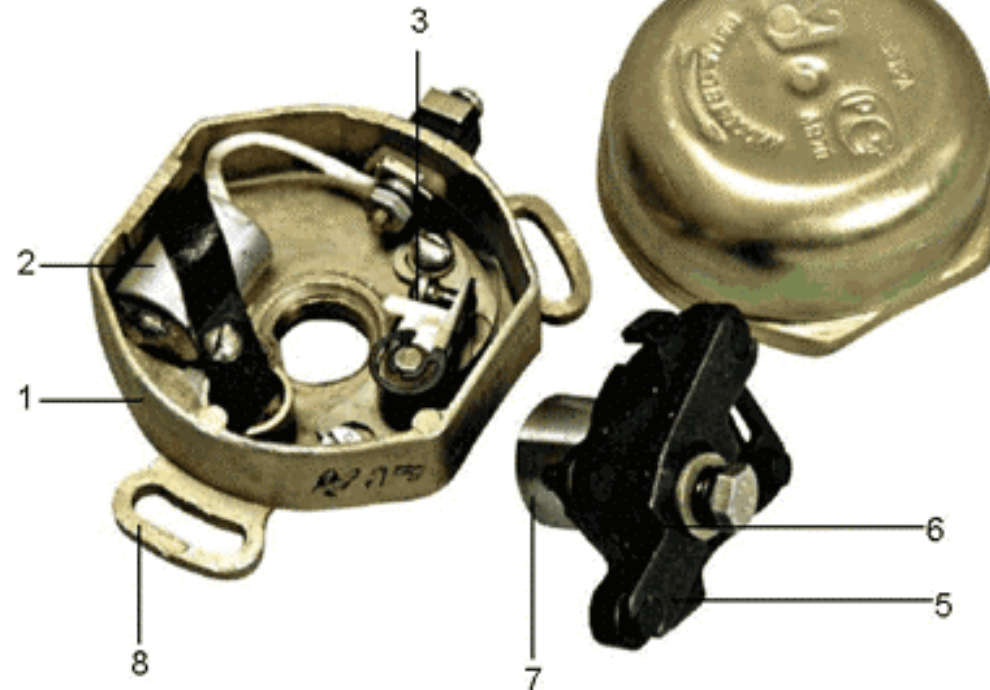
PM-302-01 12-Volt Breaker



Centrifugal Advance



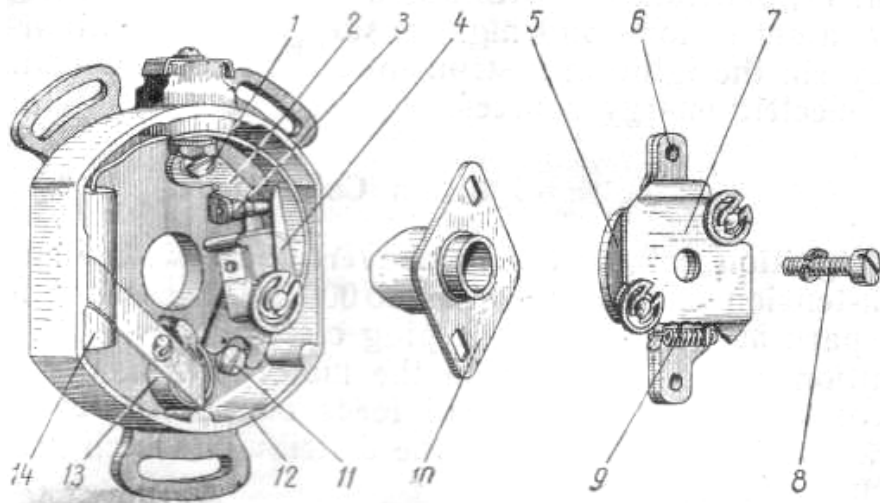
12-Volt Breaker Points



1. Housing
2. Condenser (Capacitor)
3. Breaker Contacts
4. Housing
5. Rotary Contact
6. Bushing
7. Rotor

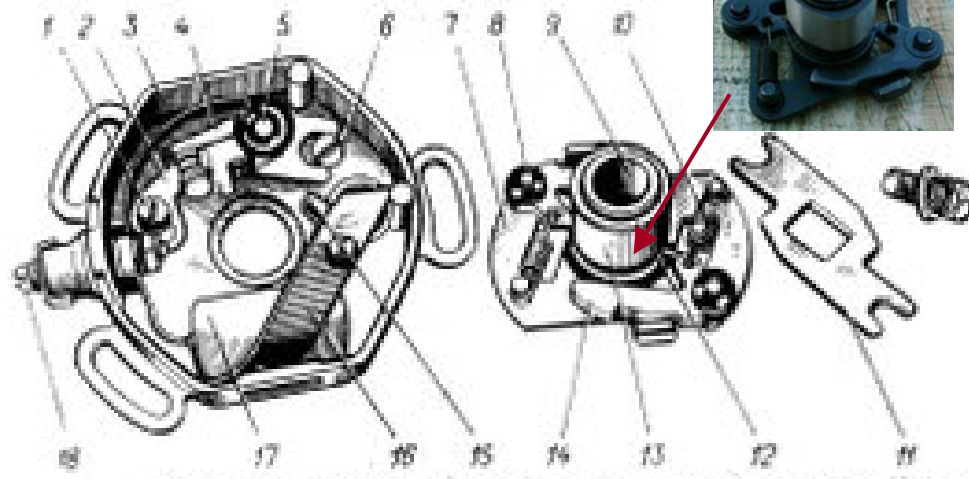
Automatic ignition advance PM-302 Breaker consists of a body with a lid, cam with a centrifugal regulator, breaker contacts, capacitor and a felt pad to lubricate the cam. The breaker is attached to the crankcase with three screws and can be rotated at an angle, through which you can set the desired time of ignition timing. The breaker gap is set using the eccentric adjusting screw.

PM-11 and PM-302A Breakers



PM-11

1 – Contact Support Fastening Screw, 2 – Contact Support, 3- Fixed Contact, 4 – Moving Contact, 5 – Timer Weight, 6 – Weight Pin, 7 – Fixed Plate, 8 – Fastening Screw, 9 – Spring, 10 – Cam, 11 – Adjusting Screw, 12 – Distributor Body, 13 – Felt, 14 – Capacitor (Condenser)



PM-302A

1 – Screw, 2 – Contact Leg, 3- Breaker Body, 4 – Breaker lever, 5 – Lever Pin, 6 – Eccentric, 7 – Automatic Spark Timer, 8 – Weight Pin, 9 – Bushing, 10 – Spring, 11 – Carrier, 12 – Locking Ring, 13 – Cam, 14 – Weight, 15 – Felt, 16 – Capacitor Holder, 17 – Capacitor (Condenser), 18 - Terminal

There are two styles of cam and flyweights. The one piece unit, less desirable due to soft pins that tend to wear out. The two piece unit better quality, but tricky as the top plate has to be put on correctly. When done correctly there are two square opens created, if done wrong the opens created are angular and the flyweights will not fling out and advance the timing.

The PM-11 was the predecessor to the more-popular PM-302/PM-302A. The weights and springs are attached to the points cam. As the cam spins on its shaft, centrifugal force causes weights to move and turn the cam on its shaft, advancing the timing of the spark, thus giving the combustion process more time to occur as the rpm increase. Full advance is usually reached around 3,000 rpm.

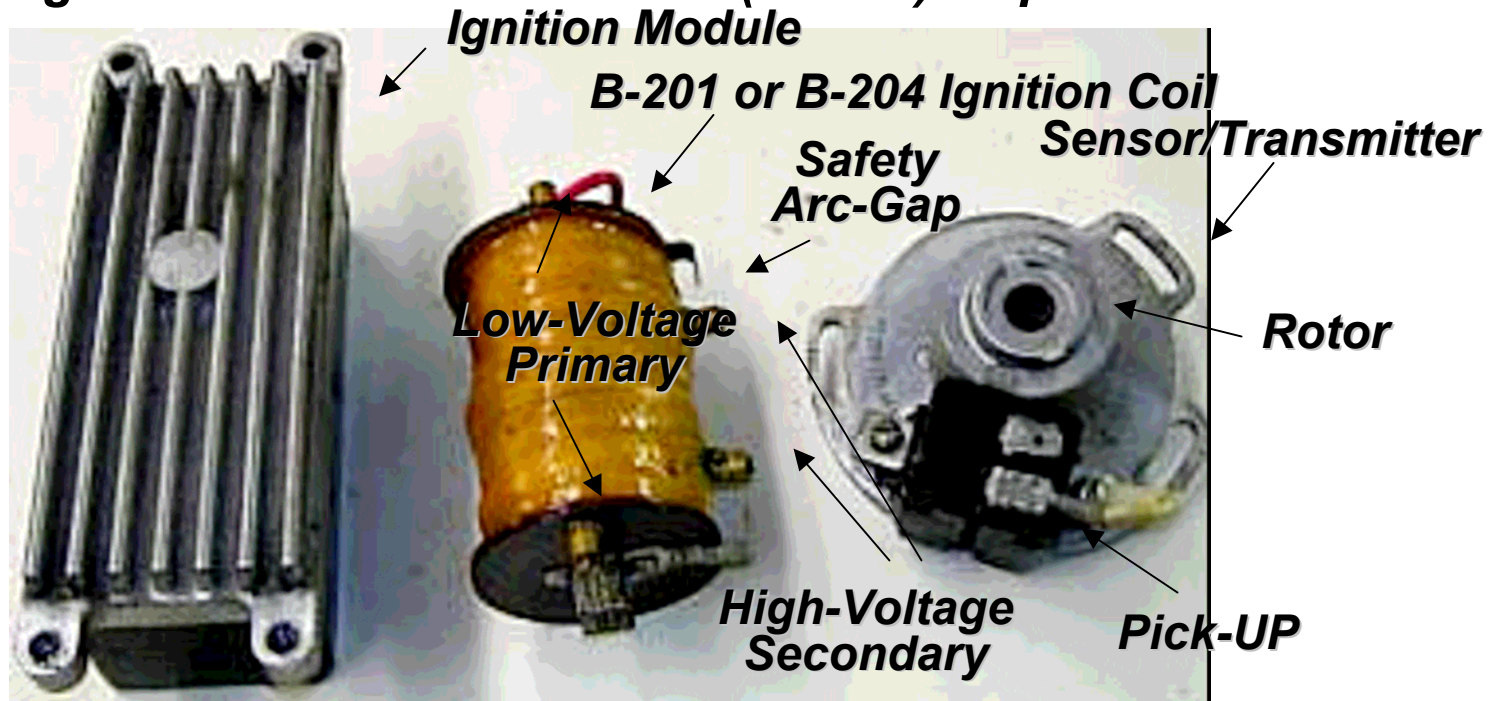
Types of Electronic Ignition (Vance Blosser, Russian Iron Motorcycle Club)

- **Type I** - Models from 1994 up to about '96 or '97 had a 'Type I' - a pot metal rotor on the camshaft with 2 steel slugs and a small sensor coil mounted close to the rotor. A hand-wound coil was also mounted under the front cover. The 'brains' of the box were a bit bigger than a VHS cassette and had big heat fins, mounted under the seat. The main problems with this system was a relatively weak spark, and sometimes the timing curve diodes would fail, but could be replaced with after-market ones and usually gave good service after that.
- **Type II** - Somewhere about 1997 or '98 Type II appeared. All the electronics fit inside a small C-shaped module that mounted under the front engine cover, across from the magnetic rotor sensor. A different ignition coil was fitted with a higher output. The components in the module were 'potted' (encased in epoxy) to protect against vibration, like military boards, but had issues with heat buildup.
- **Type III** - A few months after the Type II appeared, it was replaced with the Type III (approximately mid-1998). Physically it looked the same, but the circuit board was modified to prevent heat failure. Partway into the production span of the Type III, a high-output coil was mounted outside the front engine cover so it could stay cool. This system was very reliable, although the heavy mass of the rotor sometimes caused wear of the key. A few cases of the steel slugs coming loose from the pot metal rotor were noted.
- **Type IV** - In 2002, with the adoption of 750 engines, Type IV was introduced, featuring modern electronics. The massive pot metal rotor was replaced by a lighter stamped steel unit with notches that used a Hall-effect sensor mounted in the module cover. The electronics were incorporated inside the front rotor cover. The coil was a newer design high-output unit that mounted under the front engine cover. A plastic engine cover was used for heat dissipation. A built-in diagnostic LED simplified setting timing and gave indication of unit functionality. This unit also had some heat related issues, partly caused by a method of testing during assembly on one line - a surge was damaging a component on this line during testing.
- **Type V** - In 2004 Type V appeared, which is basically a Type IV split into 2 parts. The electronics were moved out into the air-stream for cooling. The LED was visible without any disassembly. Testing in Europe revealed no problems, but there were a few issues in the US under very hot conditions.

In the mid 80's, IMZ introduced a contact-less ignition system (BSZ), produced by the Tyumen factory "Papa". It will not work or fit early 6-Volt Motorcycles which originally had manual advance and retard levers.

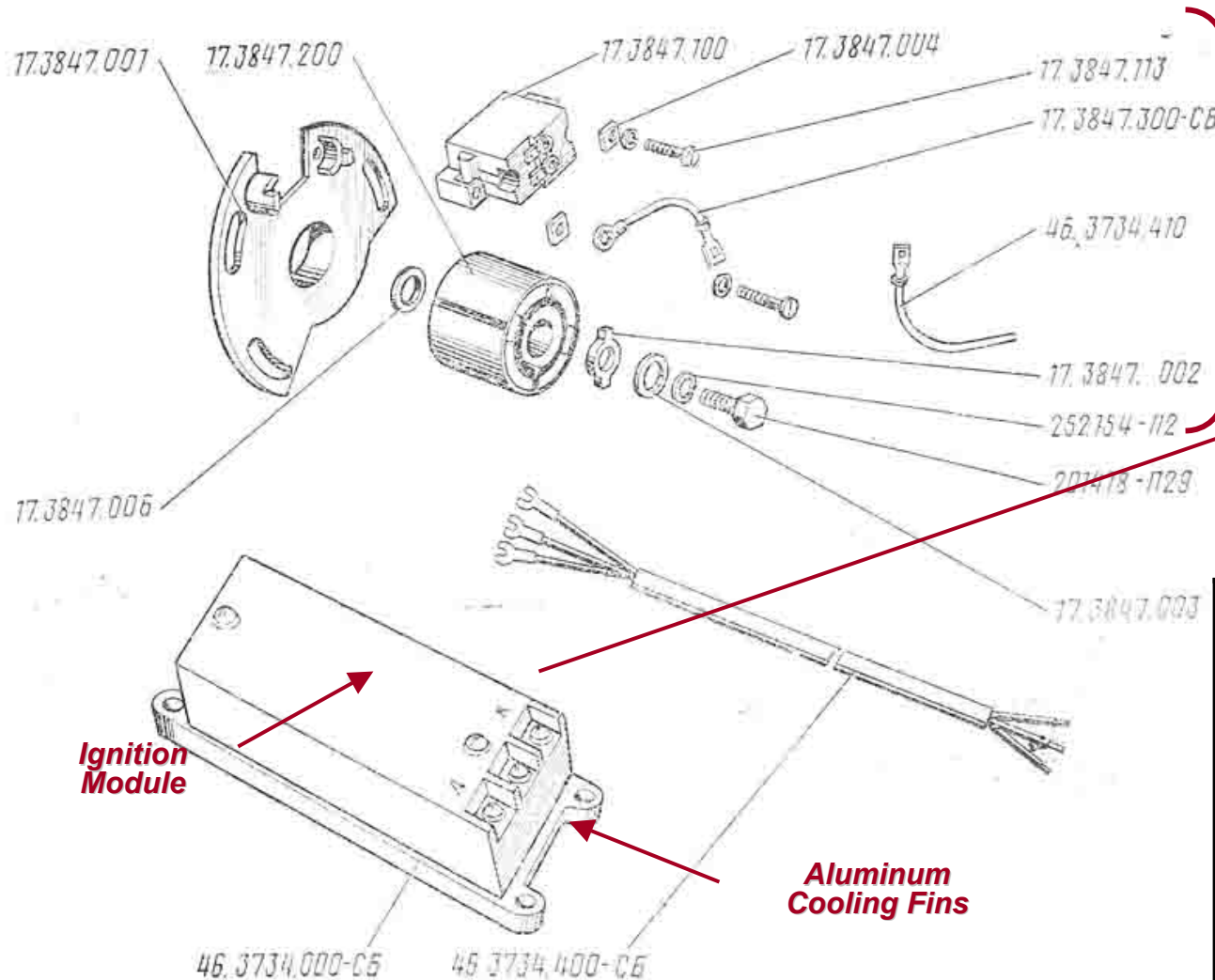
Type I Ignition System (1994-1997)

- **Ignition Module: Plastic Box with Aluminum Cooling Fins on Top**
- **Ignition Module Mounted under Seat**
- **Installed in Urals from 1994 to 1997**
- **Pot-Metal Rotor on Camshaft with 2 Steel Slugs**
- **Sensor Coil Mounted Close to Rotor**
- **Hand-Wound Coil Mounted under Front Ignition Cover**
- **Spark Plug: HGK BP7HS with 0.6mm (0.025") Gap**

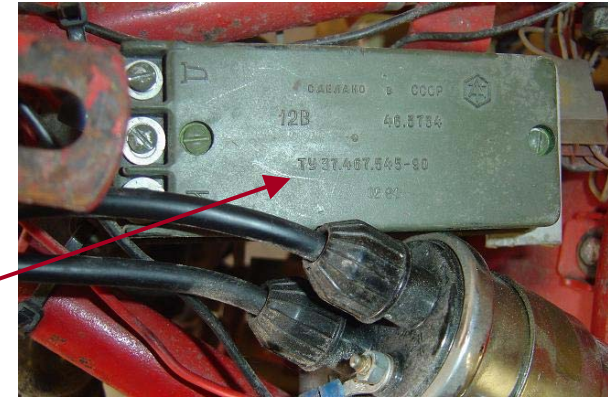


Type I ignition systems were used on Dnepr's K-650/ K-750 /MT-9 /MT-10 /MT-10.36 /MT-11 /MT-12 /MT-16 and Ural's M-61/M-62/M-63/M-66/M-67/M-67.36/Tourist and M-72.

Ural (Урал) 8.103 Type I Contact-Less Ignition 46.3734



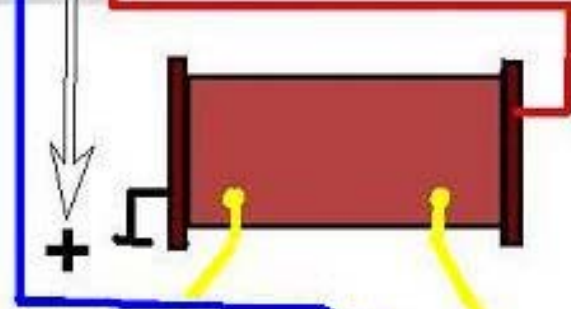
**Magnetic Sensor
(Pick-Up)**



Component	Part #
Breaker Assembly	47.3734.000
Cable	46.3734.400-C5
Ignition Box	46.3734.000-C6
Transmitter Unit	17.3847.000
Rotor Plate	17.3847.001
Rotor Key	17.3847.0002
Magnetic Sensor	17.3847.100
Rotor	17.3847.200
Ignition Coil	B-201 or B-204

The Type I ignition system had three main components; magnetic sensor, ignition module and ignition coil.

Connecting the Type I Ignition (1004-1997)



к свече
(To the Spark Plug)

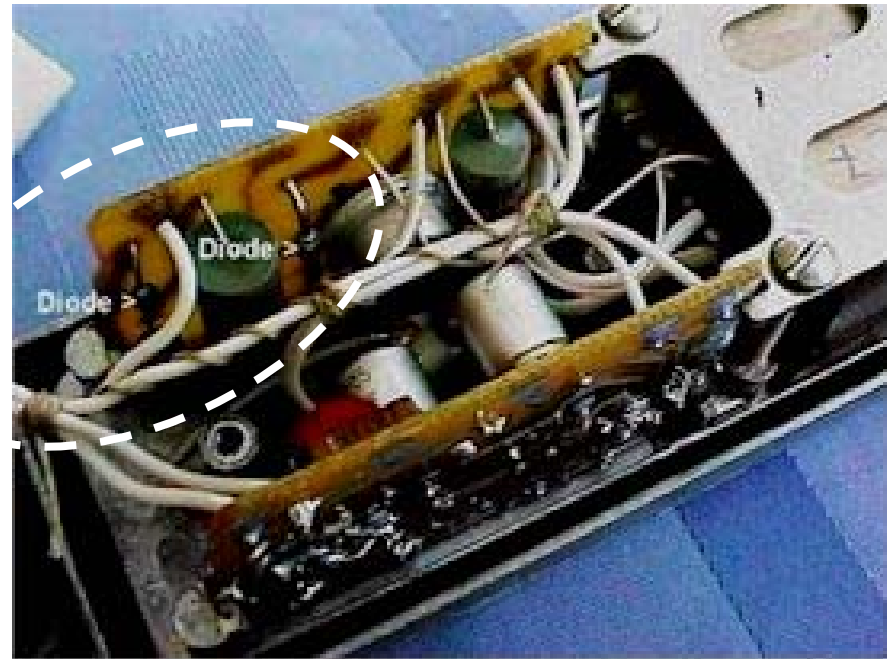
к свече
(To the Spark Plug)



Make sure the box on the Type I ignition is grounded. The ignition box is grounded only by the corner of the box and the bolt holding it to the frame. Any corrosion can stop it cold. Adding a ground wire under the box tab to a separate ground screw solves any problem.

Repair of Timing Diodes in Type I Ignition

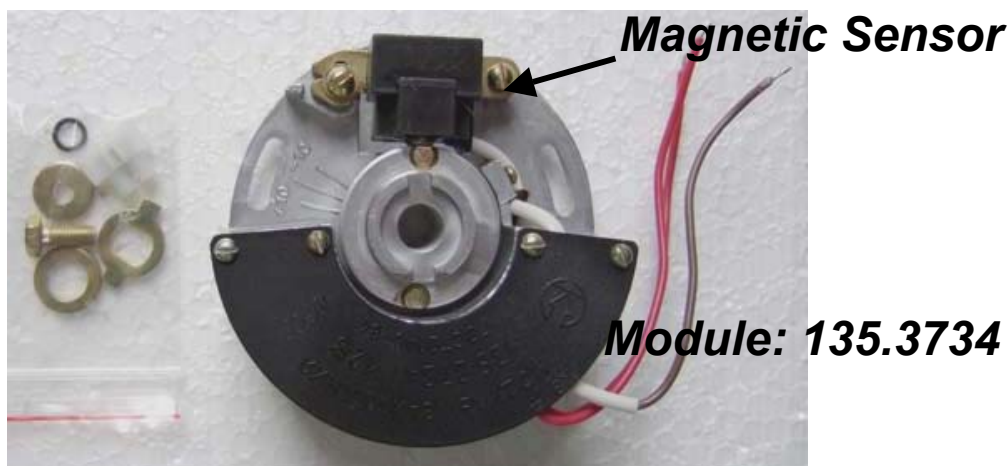
- ***Timing Curve Diodes Often Fail***
- ***Diodes Can Be Replaced with After-Market Ones***
- ***Unsolder Diodes and Replace with either Radio Shack p/n 276-1114 (2.5-Amp/1-kV) Diodes***
- ***Insure White Rings (cathode) Face Same Direction as Old Diodes***



The timing curve diodes in Type I ignition systems are easily replaced with Radio Shack diodes.

Type II Ignition (1997 or 1998)

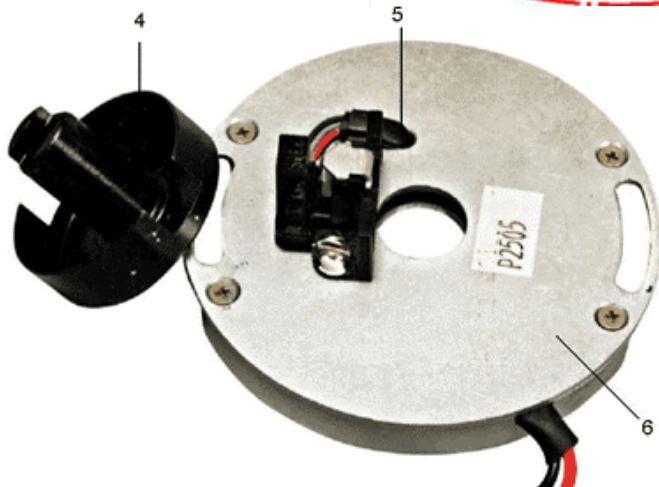
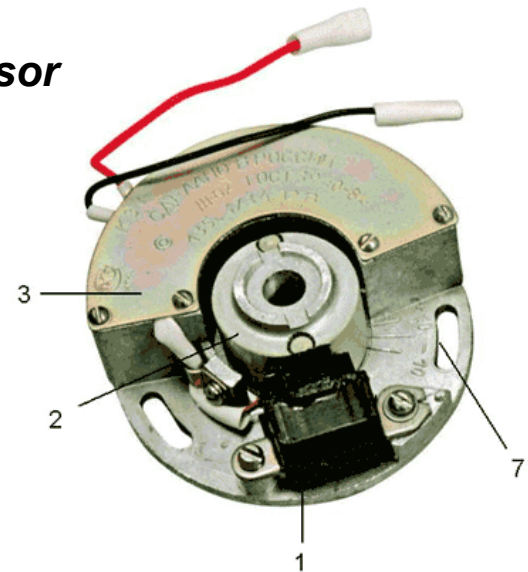
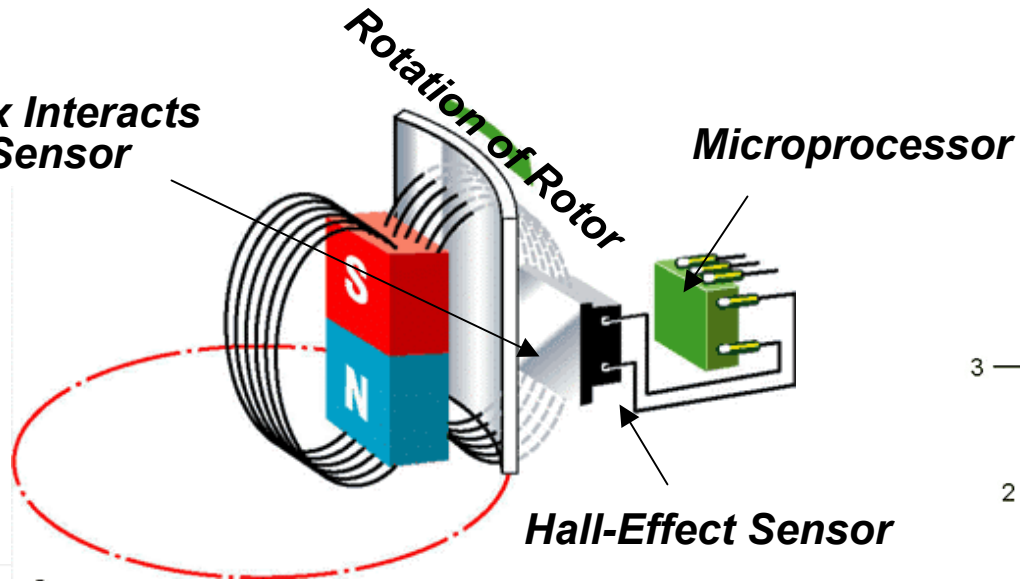
- Designated BC3 (BSZ / BC3)
- Made in USSR: SOAKE (Sary Oskol Plant of Electrical Equipment)
- Replace All Urals & Dneprs with Centrifugal-Advance Ignition (PM-302)
- Electronics Inside Small C-shaped Module Mounted under Front Ignition Cover, Across from Magnetic Rotor Sensor
- Ignition Coil with Higher Output Voltage: 135.3705 (Replaced B-201 and B-204)
- Components in Module Potted (encased in epoxy) to Protect Against Vibration
- Module Had Issues with Heat Build-Up
- Located Entirely within Front Ignition Cover
- Spark Plugs: NGK BP7HS with 0.8-1.0mm (0.03-0.04") Gap



Ural Types II/III electronic ignitions were originally designed as after-market for Ural, but also fit Dnepr. Urals approved for sale in the USA (1994) were approved for contact-less point ignition. Bikes with the manual advance/retard timing unit (PM-05) don't have a threaded hole in the end of the cam for the rotor bolt of the electronic ignition.

Type II Ignition (BSC/BC3/BSZ)

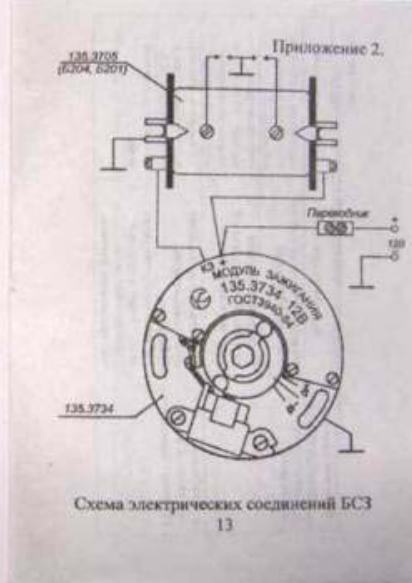
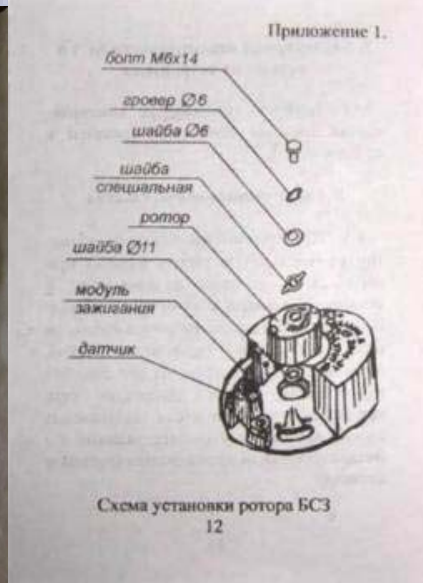
Magnetic Flux Interacts with Hall Sensor



- 1 - Hall-Effect (Inductive) Sensor**
- 2 - Rotor with Permanent Magnets**
- 3 - Electronic Commutator (breaker points)**
- 4 - Rotating Hall-Effect Sensor Screen**
- 5 - Hall-Effect Probe**
- 6 - Base for Electronic Commutator**
- 7 - Timing Marks (grooves to adjust timing)**

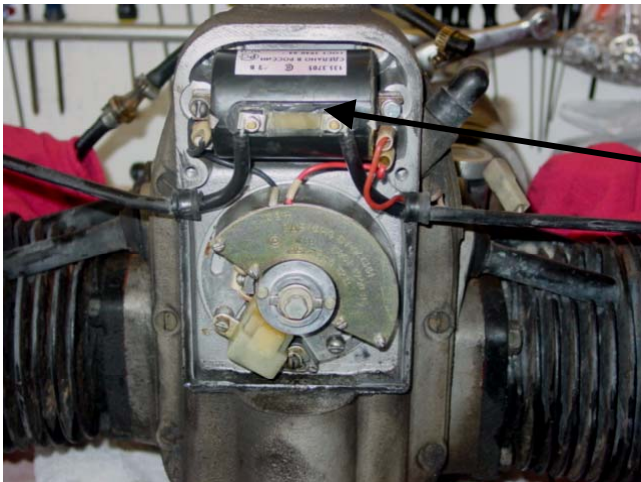
The electronic ignition relies on a Hall-effect magnetic sensor to provide a timing signal to the electronic commutator (equivalent to breaker points).

Type II Ural / Dnepr (6 to 16-Volt)

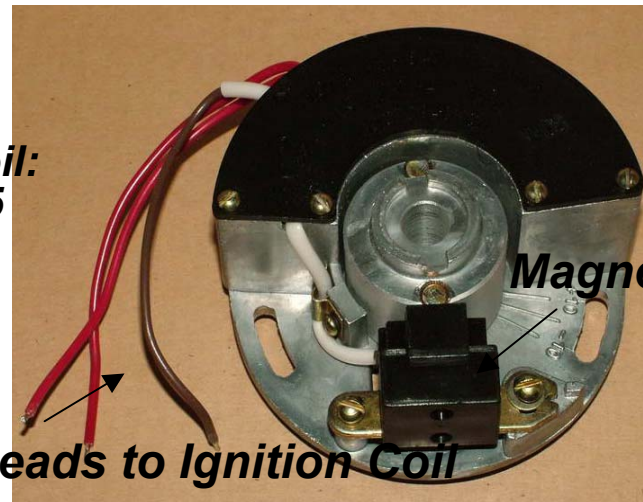


Type III (mid-1998)

- **Designated MSK (Microprocessor Ignition System)**
- **Made in CIS: SOAKE (Stary Oskol Plant of Electrical Equipment)**
- **Shortly After Type II Appeared, Replaced with Type III**
- **Same Appearance as Type II Ignition System**
- **Located Entirely within Front Ignition Cover**
- **Circuit Board Modified to Prevent Heat Failure**
- **Partway into Production Span of Type III, a High-Output Coil Was Mounted Outside the Front Engine Cover for Cooling**
- **System Very Reliable**
- **Spark Plugs: NGK BP7HS with 0.8-1.0mm (0.03-0.04") Gap**



Ignition Coil:
135.3705

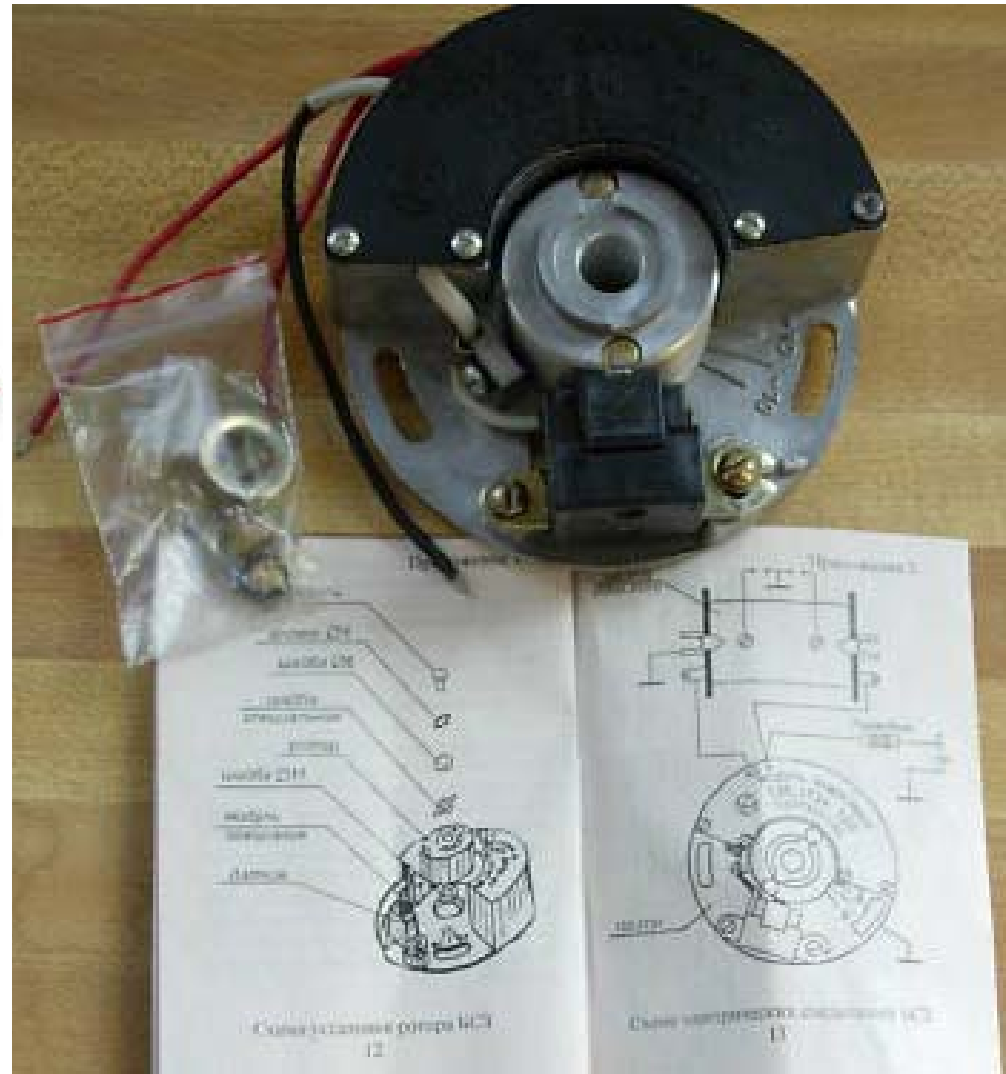
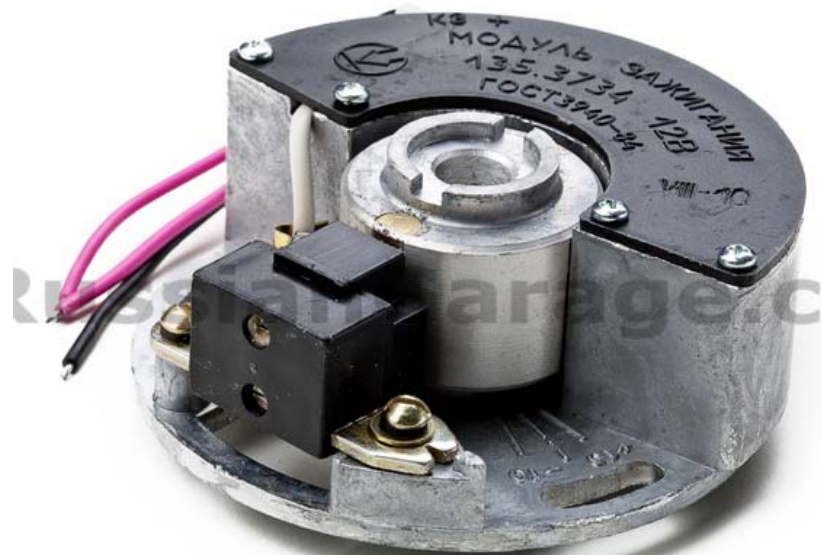


Magnetic Sensor

Leads to Ignition Coil

The ignition coil is in the front compartment. There is a horseshoe-shaped electronics, a pick-up and a metal rotor with magnets embedded in it on the end of the camshaft that held in place by a D-washer that is made of "unobtainium".

Type III Contact-less Electronic Ignition



Type III Ignition (Heavy Mass of Rotor Causes Key-Wear)



**Lower View of Front Ignition
Compartment Showing Key
Washer**



**Upper View of Front Ignition
Compartment Showing
Ignition Coil**

The washer "keying" the rotor to the camshaft can wear over time allowing play in the rotor. The engine will run poorly (backfiring, running on one side better than other, poor performance). Riders need to check for security of the rotor's steel slugs and the magnets.

Type IV (2002) *(Bill Glaser's myural.com site and 2002 Ural Manual)*

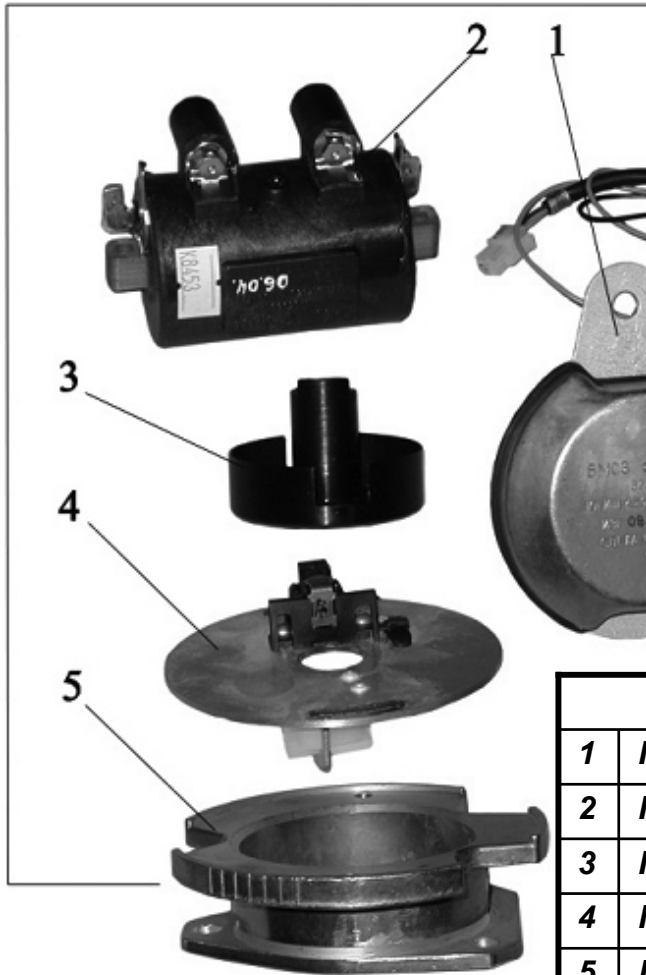
- **MSZ UKTUS Ignition on CMSI 8.103**
- **Introduced in 2002 with Adoption of 750cc Engine**
- **Located Entirely within Front Engine Cover**
- **Massive Pot-Metal Rotor Replaced by Lighter Stamped Steel Unit with Notches**
- **Uses Hall-Effect Magnetic Sensor Mounted in Module Cover**
- **Newer-Design, High-Output Coil Mounted inside Front Ignition Cover**
- **Built-In Diagnostic LED Simplified Timing**
- **Sparkign Voltage:**
 - 17-kilovolt (kV)
- **Operating Temperature:**
 - -50 to +100°C
- **Ignition Coil**
 - Best with 3705060
 - Also Works with B-201 and B-204
- **Current Load:**
 - Engine Off: 0.10 to 0.15-Amp
 - Self-cleaning Contacts
 - Engine On (200-6,000 rpm): 1.5-Amp
- **Supply Voltage: Nominal 12-Volt**
 - 7-to-16-Volt Operation



The silver "hockey puck of doom," with the blinking LED, was located inside the front engine compartment and suffered from heat build-up.

Type IV Microprocessor Ignition System (2002)

TYPE IV 135.3734.COM-2 (CDI)



<i>Microprocessor Ignition System, 37.34010</i>			
1	<i>IMZ-8.108-17013</i>	<i>453619001</i>	<i>CDI (Capacitor Discharge Ignition)</i>
2	<i>IMZ-8.108-17010</i>	<i>KMCZ 3705060</i>	<i>Ignition Coil 135.3705-2 (5-Ohm)</i>
3	<i>IMZ-8.108-17071</i>	<i>301262.008</i>	<i>Rotor</i>
4	<i>IMZ-8.108-17002</i>	<i>687422.009</i>	<i>Hall-Effect Magnetic Sensor (Pick-up)</i>
5	<i>IMZ-8.108-17135</i>	<i>731151.017</i>	<i>Casing</i>
6	<i>IMZ-8.108-17008</i>	<i>3734010</i>	<i>Microprocessor Ignition System (MAS)</i>

***If the microprocessor (round silver puck with LED)
is under the front ignition cover you have a Type IV,
if the puck/LED is outside you have a Type V.***

Type IV for 12-Volt Ural/Dnepr (ural-hamburg.de)



TYPE IV 135.3734.COM-2 (CDI)

Type IV/V Rotor Evolution: Two-Piece to One-Piece Rotor

(www.myural.com/interrupterreplacement.htm)



**Left: Early-Manufactured, Two-Piece, Swaged-Joint Interrupter; Shoulder Meeting Round Skirt
Right: Newer One-Piece, Machined Interrupter**



**Left: Two-piece, with Swaged Seam on Back
Right: One-piece; Devoid of Swaged Seam**



Type V Ignition Rotor with Swaged seam

Ignition Rotor (750cc)

up to 2006 (MSZ): IMZ-8.1037-17220-20

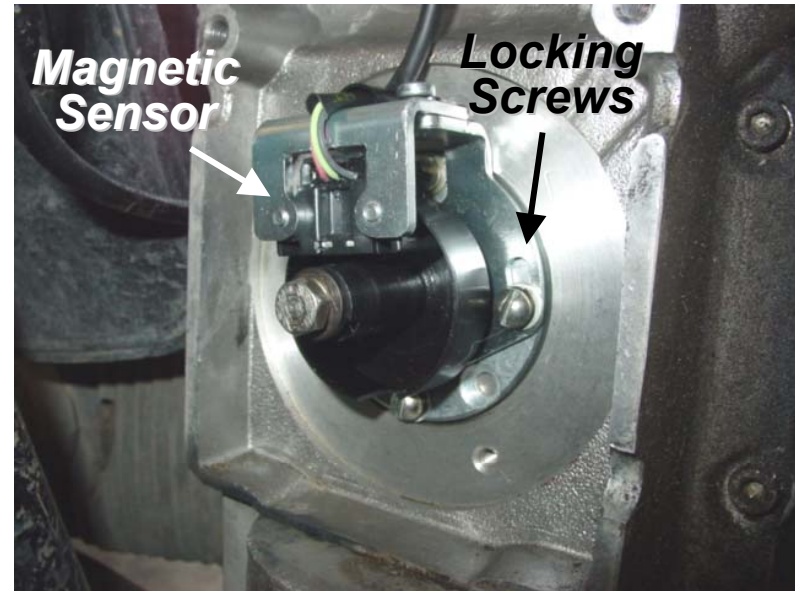
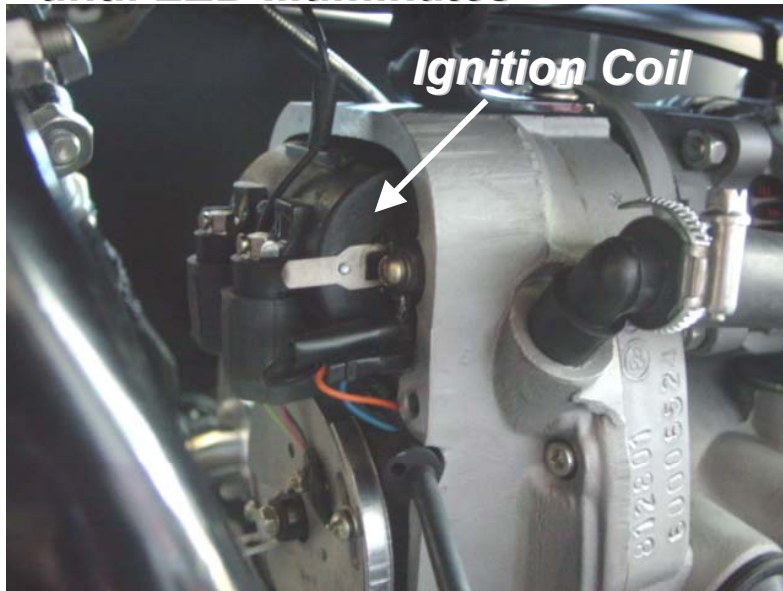
from 2007: IMZ-8.1037-17220-10

Note: New style, one-piece rotors are available for Type IV & V electronic ignition.

The two-piece rotor will fail, causing timing issues (slip, throwing timing out the window) from a slight miss to not running. Replace the two-piece with the one-piece rotor! The ignition rotor was changed to a new "one-piece type" in 2007.

Type V Ignition System (2004) (<http://sovietsteeds.com/forums/>)

- **UKTUS Ignition**
- **Basically Type IV Split into Two Units: Magnetic Sensor and Electronic Commutator (Puck)**
- **Magnetic Sensor (Pick-Up) and Interrupter Located in Front Ignition Cover**
- **External Puck: Electronics Moved into Air-stream for Cooling**
- **Timing LED Now Visible without Disassembly of Front Ignition Cover**
- **Type IV Failed to Advance Timing Once Engine above 3800-4000 rpm**
- **Possible Problems under Hot Conditions**
- **Timing Adjustment:**
 - **Bring up the Full-Advance Timing Mark on Flywheel and Rotate Sensor Unit until LED Illuminates**



The silver "hockey puck" was moved to the frame near the front right side of the gas tank, with an LED that blinks when the engine is running. The coil and rotor/pick-up unit remained inside the front compartment.

Type V Ignition 2004 Ural Patrol



Type V Russian Ignition (from a 2005 Retro)

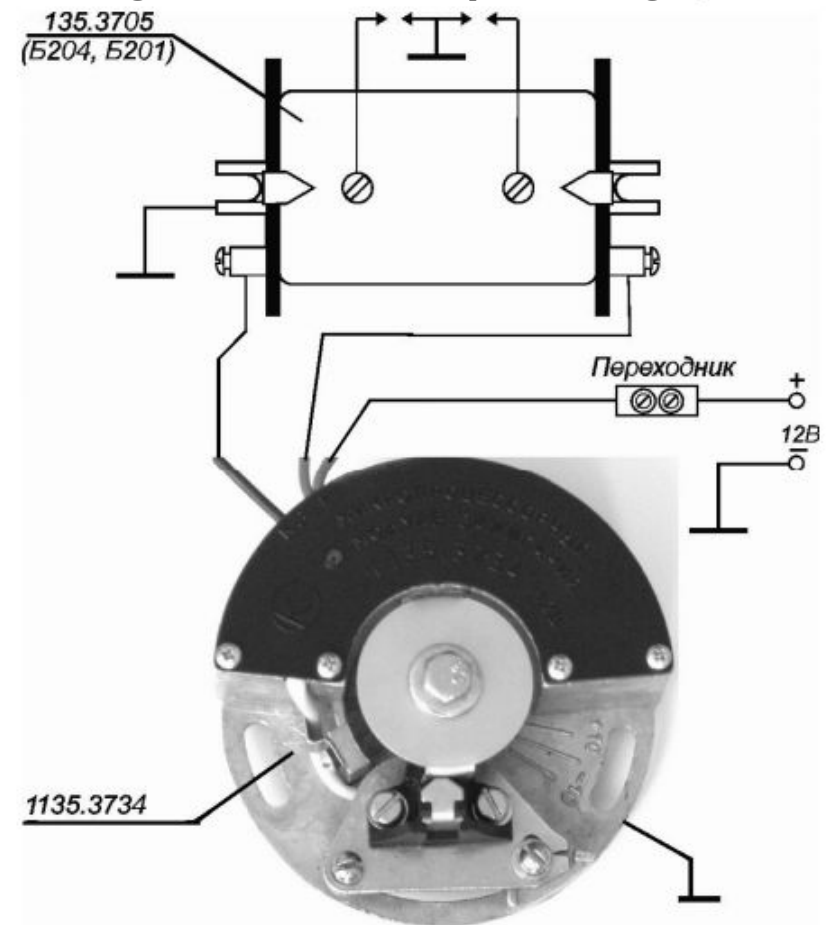
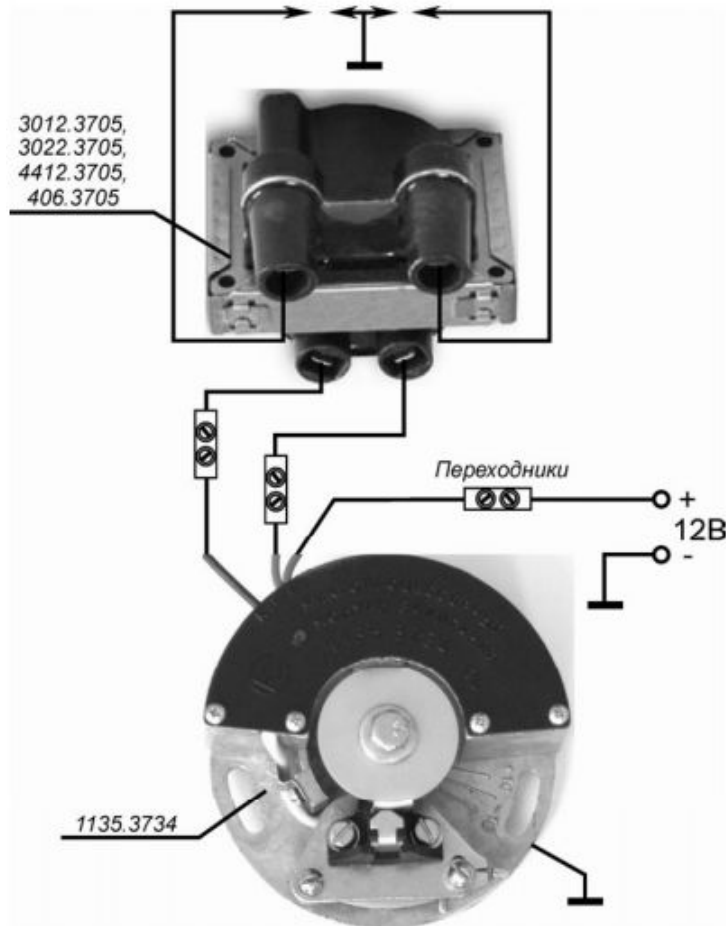




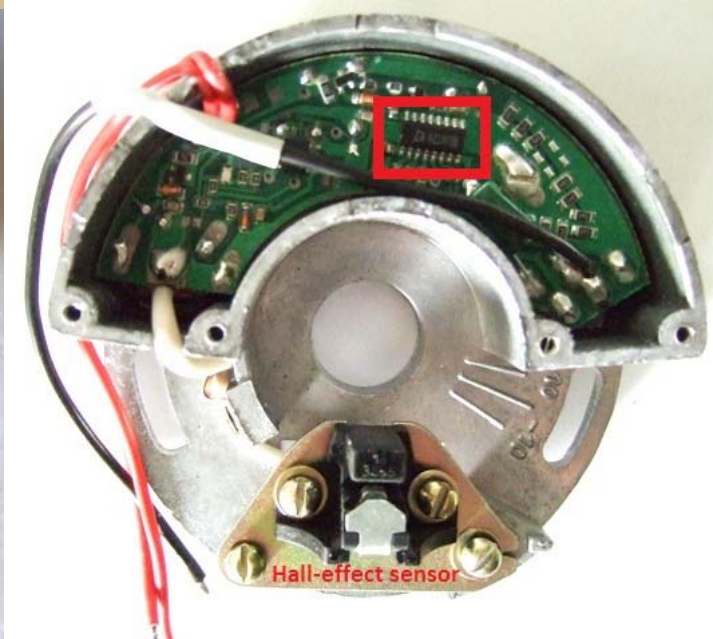
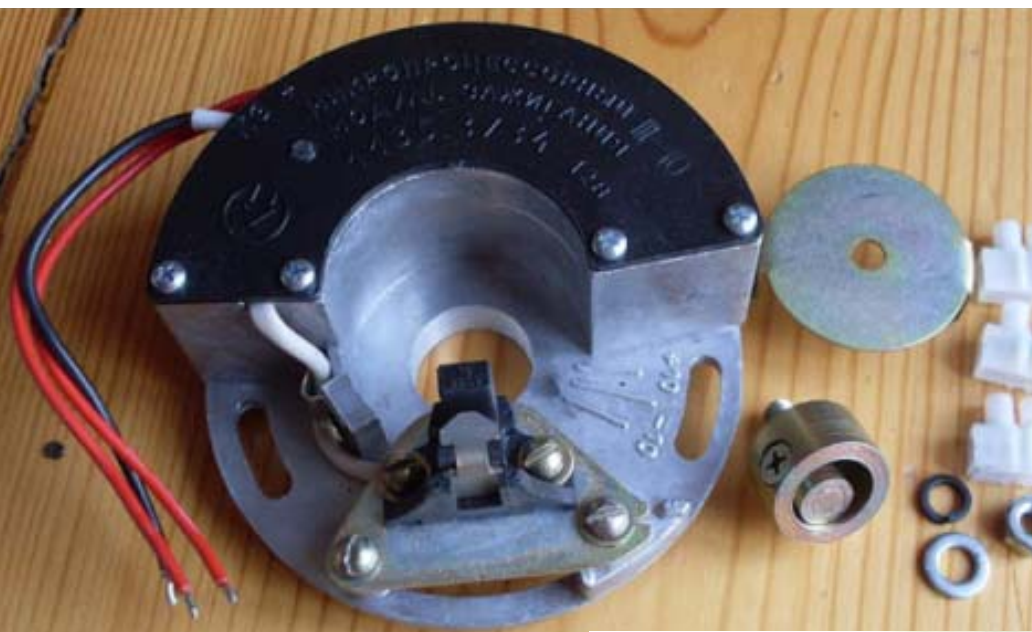
New Microprocessor-Based Electric Ignition System

Model 1135.3734 (Ignition<http://seriousbill.multiply.com>)

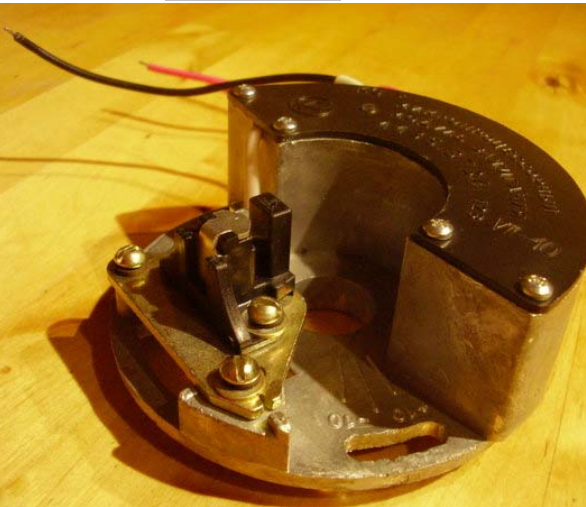
- **New Type Has LED for Timing**
- **New Rotor Made of Very Light Flat Plate**
 - **Fixes Old Problem of Rotor Breaking-Up or Chattering and Damaging Tabbed Washer**
 - **Potential for New Problem, as There Is No Way to Positively Lock the Rotor in Position, So It Can Slip**
 - **Careful Use of Loctite and Proper Tightening of Screw Keeps Things In Place**



Improved Version replacing Old Model 135.3734: Model: 1135.3734 (5 to 12-Volts)



New Model 1135.37 (Ignition<http://seriousbill.multiply.com>)



Ducati Ignition System (2006)

- **IMZ-8.108-17008-07: Conversion Kit**
- **Ignition by Ducati Energia (not affiliated with Ducati Motorcycles)**
- **One-Piece Rotor Standard**
- **Standard with January 06 Ural Production**



Not much in the front compartment other than the interrupter and the pickup. The ignition coil is a small square box mounted under the front of the gas tank and the spark plug wires go to that box. The brain box for the Ducati is placed near the battery.

Ducati Ignition System



Ignition Coil



Ducati Ignition System



<i>Ducati Ignition assembly IMZ-8.108-17008-07</i>	
<i>Pick Up Without Support Plate, Includes all brackets and hardware necessary to install ignition system</i>	433138540
<i>Support plate for pickup</i>	'IMZ-8.1037-17120-10
<i>Digital CDI</i>	432406020
<i>Ignition Coil</i>	432262000
<i>Rubber Holder</i>	534801720
<i>Support plate for Ignition</i>	IMZ-8.1037-17123-10
<i>Support bracket for CDI</i>	IMZ-8.1037-17016
<i>Ignition mounting set for pickup</i>	IMZ-8.1037-30026
<i>High-Voltage Cables with Caps Ignition Coil with Spark Plug Caps</i>	532165770

Ducati, introduced in 2006 Urals, has proven to be a reliable electronic (contact-less) ignition system for Urals and retro-fitted Dneprs.

Ural Power Arc Ignition System (racewayservices@gmail.com)

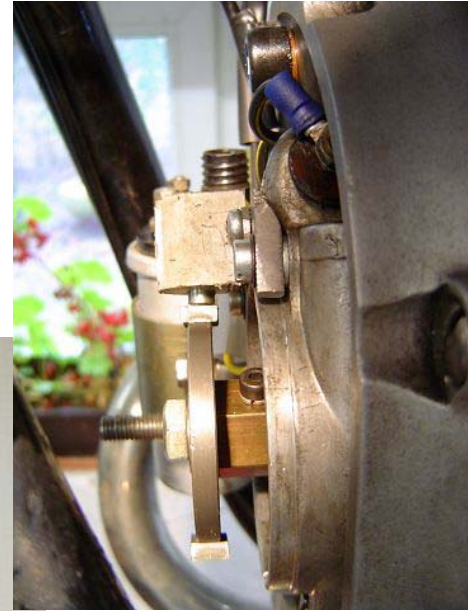
- **Retrofit Ducati or Types II-thru-V Russian Ignitions**
- **Two Ignition Curves Loaded into Processor**
 - **Standard Ural/Ducati Curve**
 - **Second Curve Accessed via Momentary Toggle Switch**
- **Coil Receives No Current if Engine Not Running**
 - **No “hot” Coil**
- **Multi-Spark Feature (fires three times each firing cycle)**
- **Simple Installation**
 - **Built -In LED Timing Light**
 - **Tachometer Lead and Rev-Limiter Available**
- **Exclusively Distributed by Raceway Services**



Raceway Services offers the Power Arc System to cure the problems of previous Type II thru V ignition systems and provide improved performance.

Powerdynamo Ignition System (www.powerdynamo.biz)

- ***Electronic Ignition for Early Soviet 6-Volt M-72***
- ***Kit Contains:***
 - ***Trigger Unit / Rotor Unit***
 - ***Advance Unit***
 - ***AC/DC Converter***
 - ***Twin Ignition Coil / HT-Cable***
 - ***Incidentals***



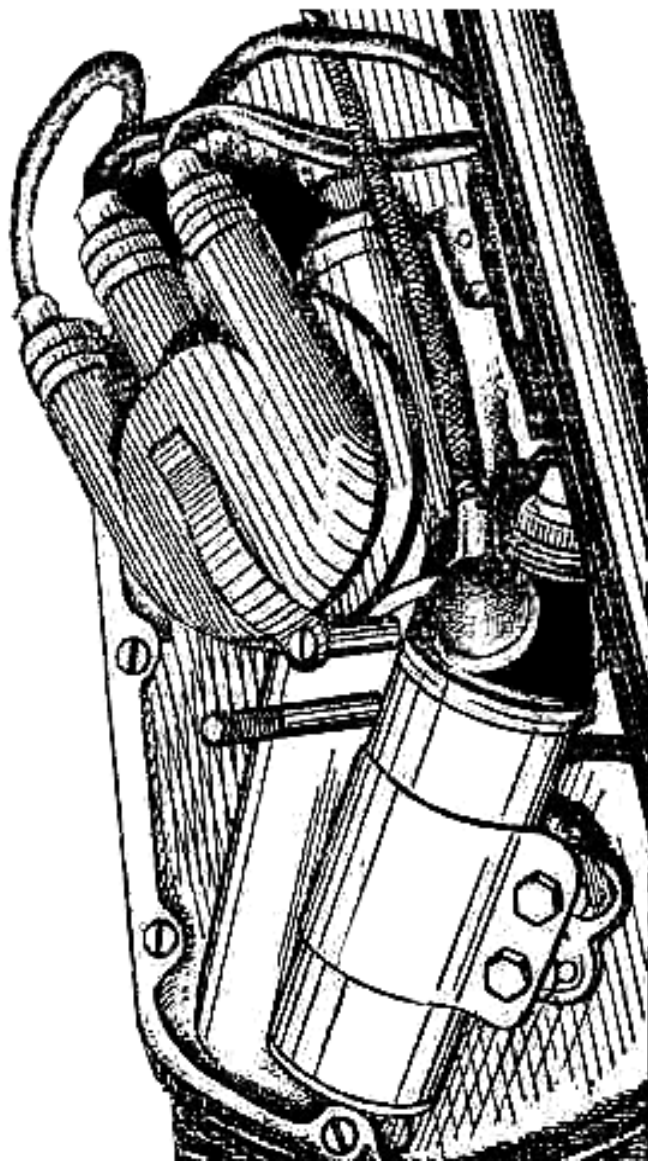
The distributor cap and rotor are taken off and are no longer used.

Ignition Coils

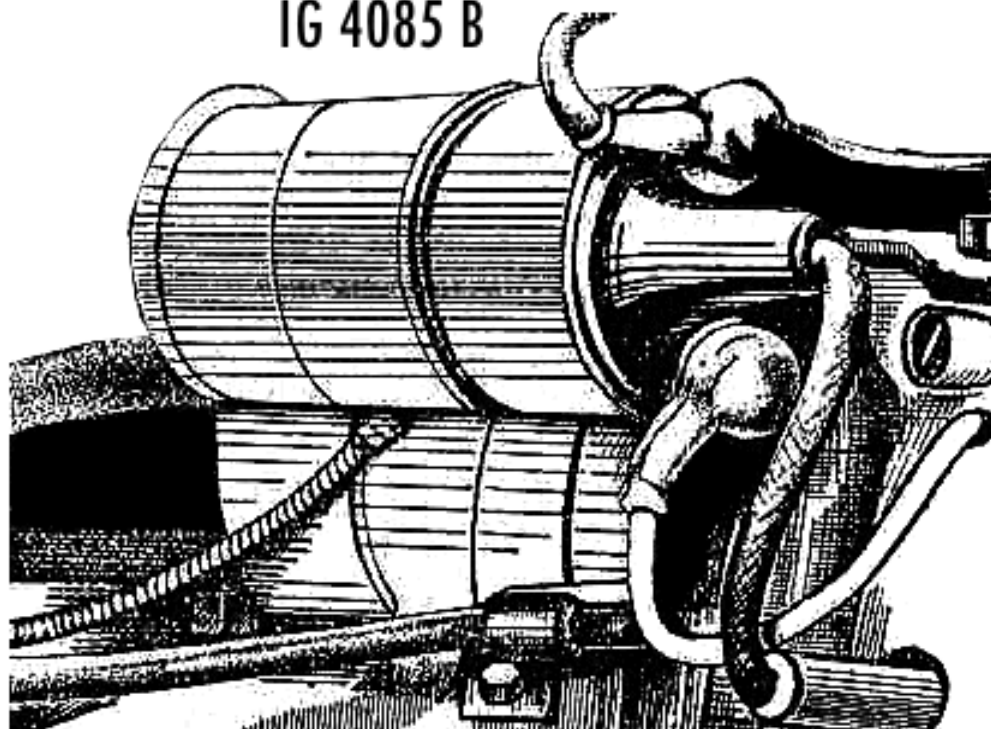
- **Ignition Coils for Contact (Breaker) Systems**
 - **KM-01 Coil** ↔ **PM-05 Breaker/ Distributor**
 - **IG-4048 Coil** ↔ **PM-05 Breaker/ Distributor**
 - **B11 Coil** ↔ **PM-05 Breaker/ Distributor**
 - **B2B Coil** ↔ **PM-05 or PM-11 Breaker/ Distributor**
 - **B201 Coil** ↔ **PM-302 Breaker/ Distributor**
 - **B204 Coil** ↔ **PM-302/302A Breaker/ Distributor**
 - **Primary Winding Resistance of 5-Ohms**
- **Ignition Coils for Contact-Less (Electronic) Systems**
 - **Type I –to- Type V Ignition Systems**
 - **Most Electronic Ignition Coils Have 1 -to- 2-Ohms**
 - **Type I Ignition Coil: 5-Ohms**
 - **Types II, III, IV and V Ignition Coils: 1 -to- 2-Ohms**
 - **Ducati Ignition System**
 - **Ural Power Arc Ignition System**

**Each ignition coil is associated (paired)
with a distinctive, corresponding ignition system.**

KM-01

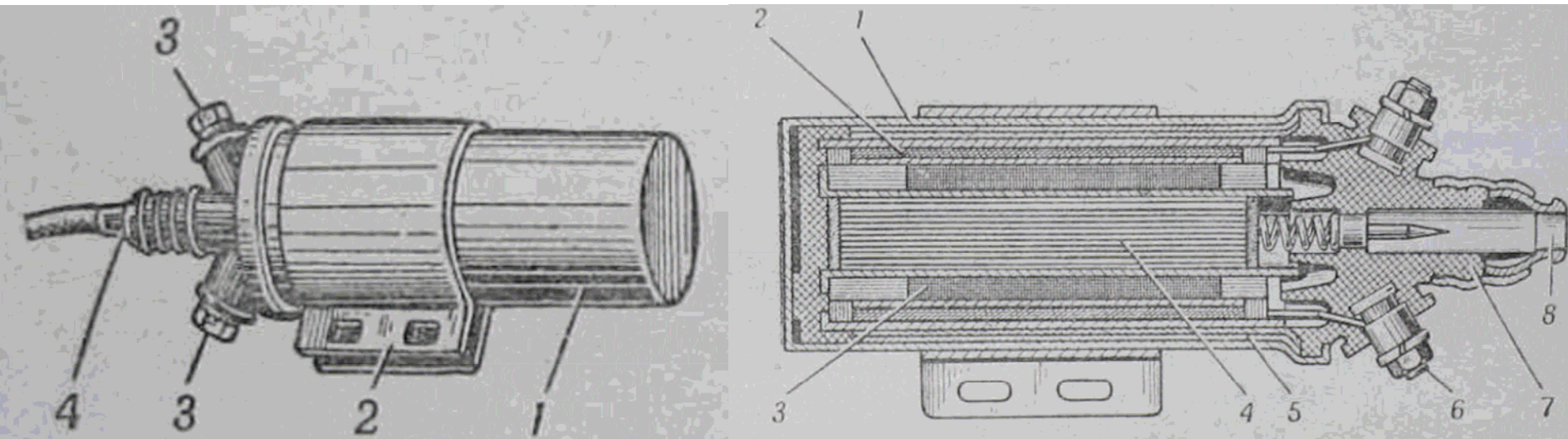


IG 4085 B



The first ignition coil used on a heavy Russian motorcycle (M-72) was the KM-01, which was replaced with the IG-4085B.

KM-01 6-Volt Ignition Coil for M-72

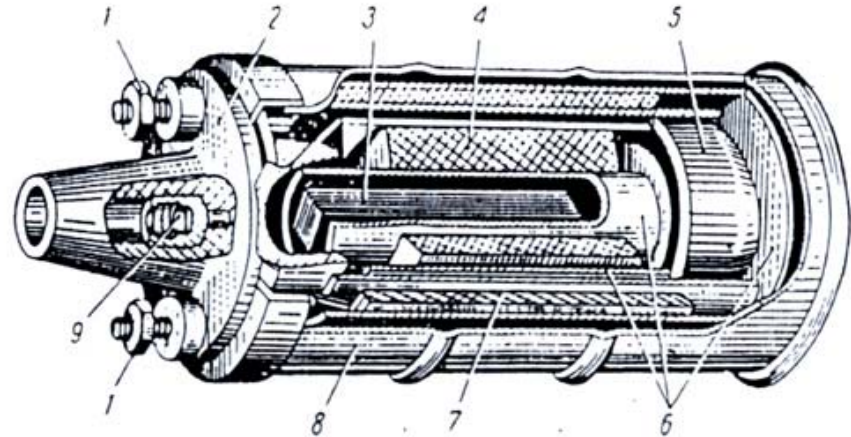
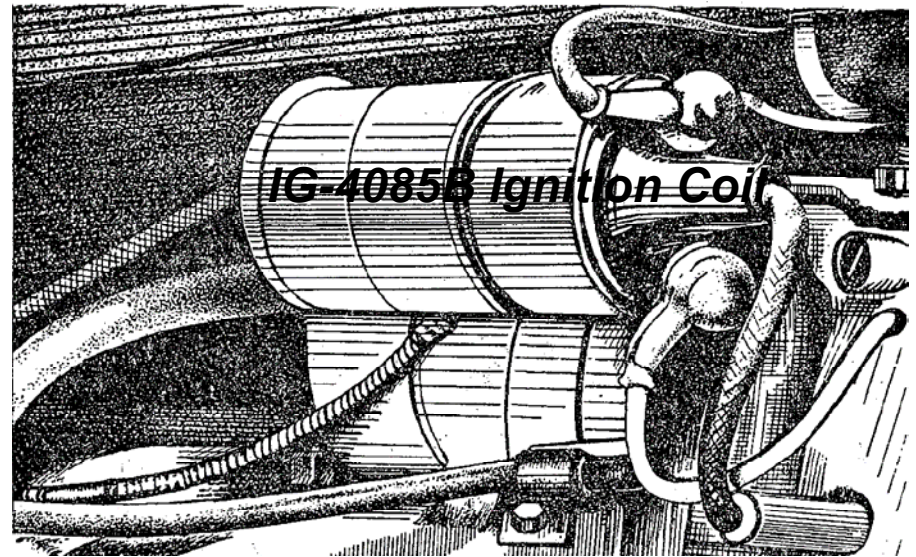


- 1. Case**
- 2. Mounting Bracket**
- 3. Primary Interrupted Winding**
- 4. Hi-Voltage Secondary Output**

- 5. Mounting Bracket**
- 6. Primary Interrupted Winding**
- 7. Insulator**
- 8. Hi-Voltage Output to Distributor and Spark Plugs**

The ignition coil is nothing more than a transformer. One end of the primary (low-voltage) winding is common to the secondary (high-voltage) winding. The beginning of the primary winding is connected thru the ignition switch connected to the battery, and ends where the contact breaker is closed to ground (mass).

IG-4085B and B2B (Б2Б) Ignition Coils (6-Volt) for Ural M-72 and Dnepr K-750, MB-750, MB-650, Dnepr 650, M-72

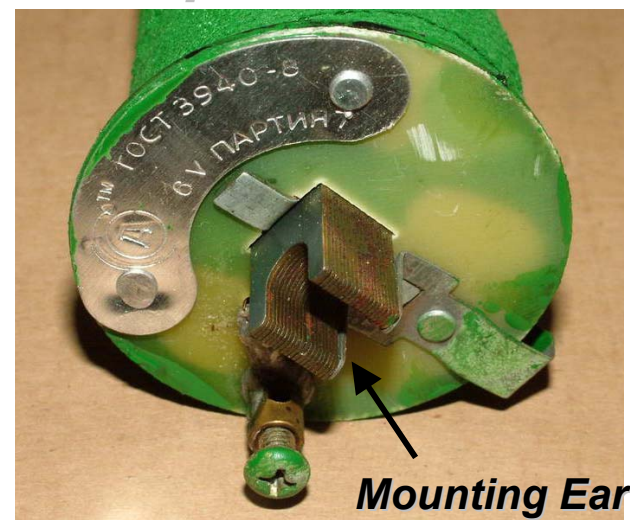
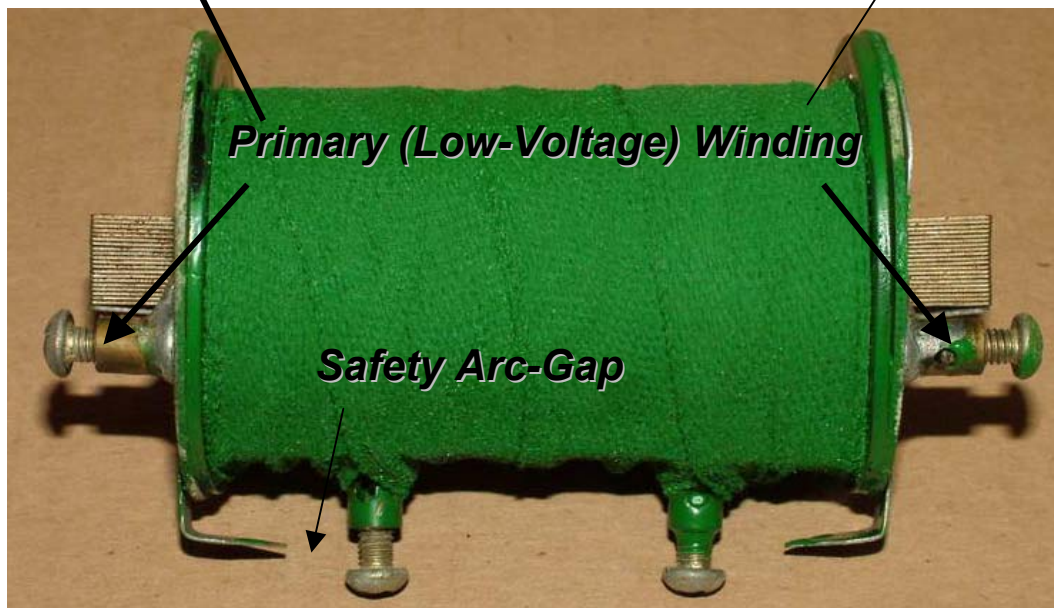
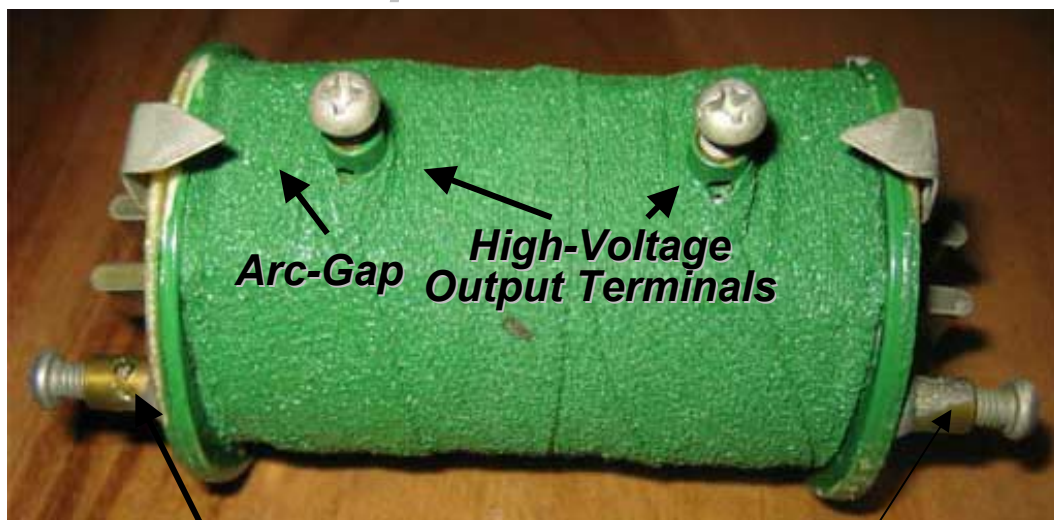


B2B Ignition Coil

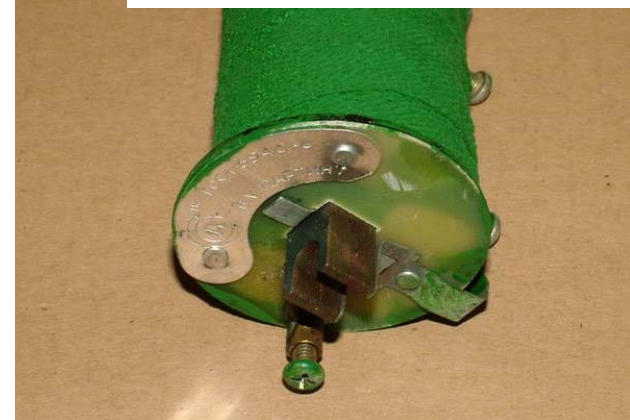
1 - Low-Voltage (6-Volt) Terminals to Battery and PM-05 Breaker, 2 - Plastic Cap, 3 - Magnetic Core, 4 - Low-Voltage Winding, 5 - Shield, 6 - Insulator, 7 - High-Voltage Winding, 8 - Case, 9 - High-Voltage output to PM-05 Distributor

The IG-4085B and B2B coils later replaced the KM-01.

B201 (Б201, 6-Volt) Ignition Coil (катушка зажигания) for Ural/Dnepr K-750, MB-750, MB-650, Dnepr 650, M -72

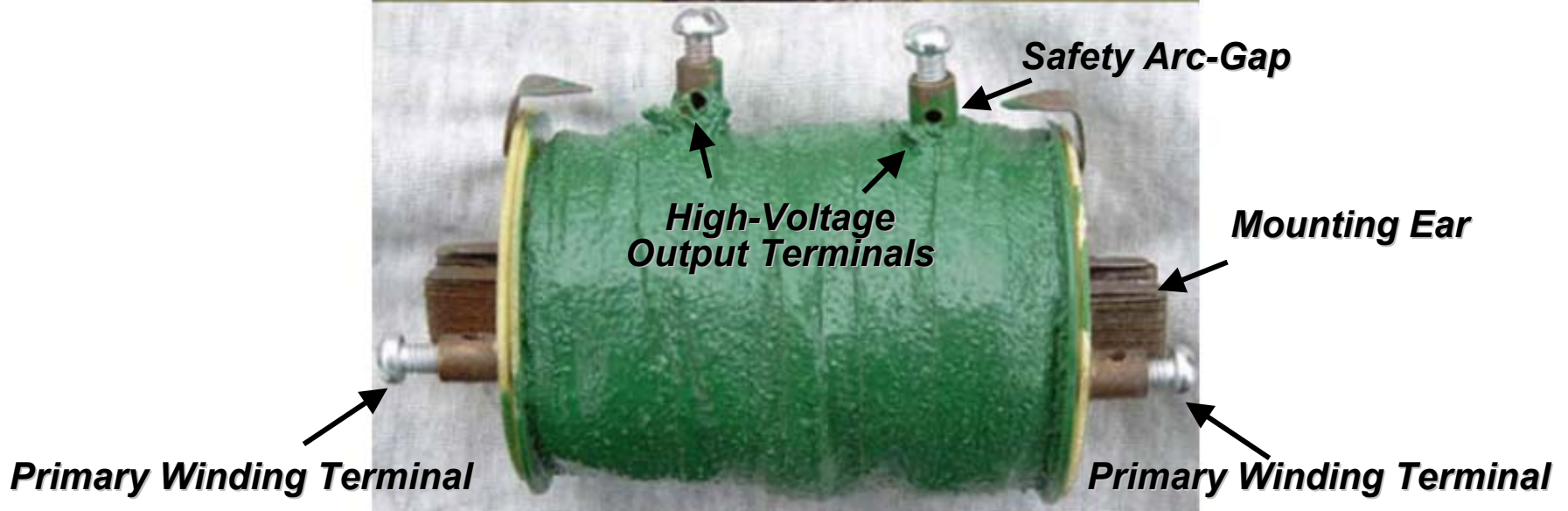


- **Input Voltage:** 6-Volts
- **Gap between Discharges:** 9 mm
- **Primary Winding:**
 - 300 turns / dia. 0.55 mm Wire
 - Wound on 3 Layers
- **Secondary Winding:**
 - 19,000 \pm 200 turns / dia. 0.09 mm Wire
 - Wound in 2 Sections



The B201 became the standard ignition coil for 6-Volt Urals and Dneprs.

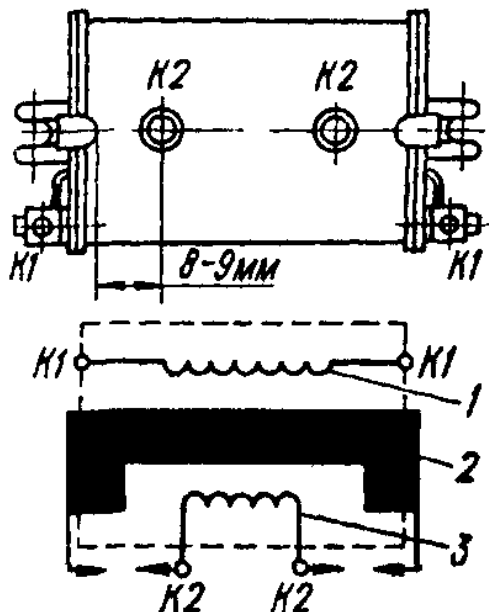
B201A (Бобина 6В Б201А) 6-Volt Ignition Coil for Ural, Dnepr Motorcycles



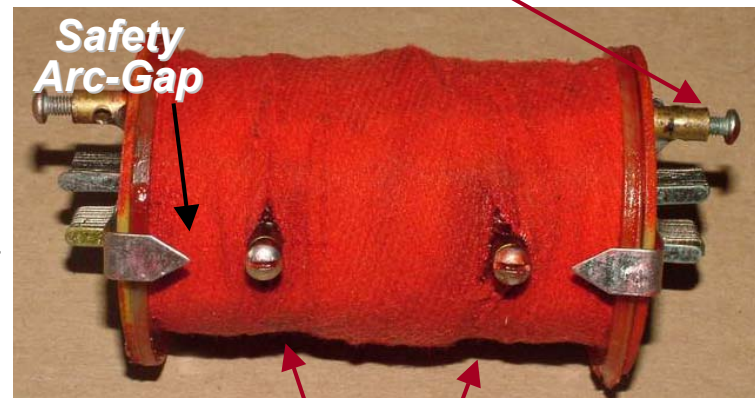
The B201A replaced the B201 ignition coil on Ural/Dnepr motorcycles.

B204 (B204) Ignition Coil 12-Volt for Ural/Dnepr

Safety Arc-Gap



Primary Winding Terminal



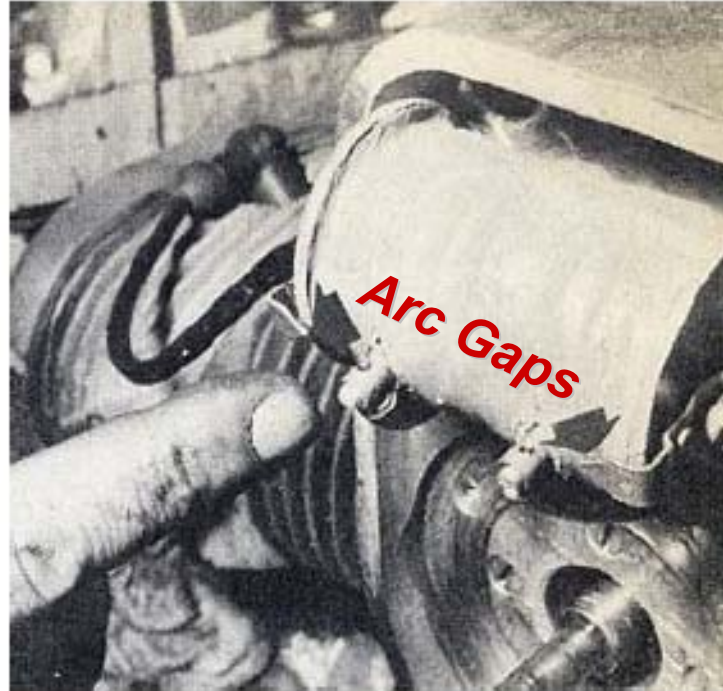
High-Voltage Output Terminals



Both plugs fire simultaneously on the left and right cylinders, one spark being formed when the compression stroke terminates in one cylinder and the other during the exhaust stroke.

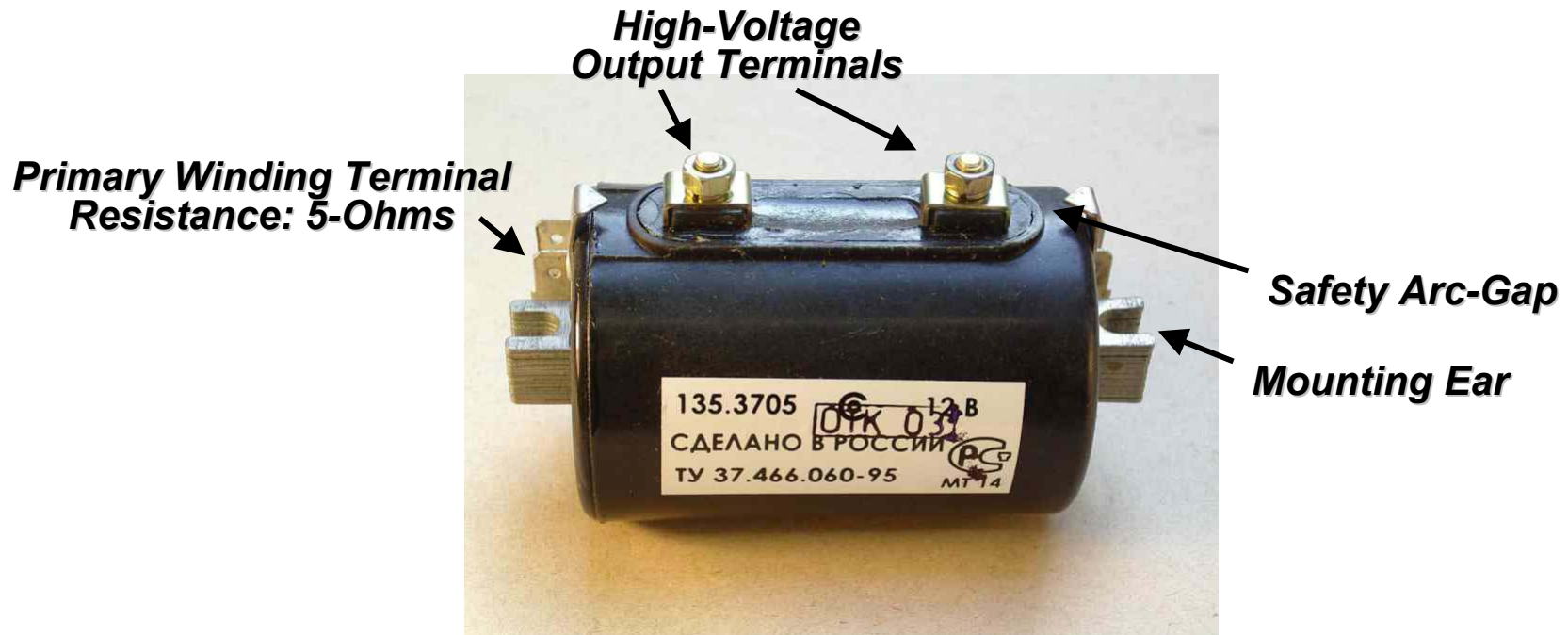
Arc Gaps on B201 and B204 Ignition Coils

***Be careful not to bend
or alter the gaps!***



***The ignition coil is double-ended with two spark
safety gaps, which were set at 9 mm (0.355").***

Ignition Coil 12-Volt 135.3705 for Type II thru Type V Ignition Systems



The 135.3705 later replaced the B204 as more contact-less (electronic) ignition systems were developed.