



***Ignition Systems***  
***for***  
***Russian Motorcycles***  
***(Part I: Introduction)***

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# ***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 and Power Arc***
- ***Ignition (Induction) Coils (Part V)***
- ***Setting Timing on Manual, Automatic and Electronic Ignition Systems (Part IV)***

***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**
    - **Part II: PM-05: Manual Spark Advance /Retard**
    - **Part III: PM-11/PM-302 Breakers: Automatic Spark Advance**
  - **Contact-Less (Electronic) Breakers**
  - **Contact-Less (Electronic) Systems: Part IV:**
    - **Type I -to- Type V Ignition Systems**
    - **Ducati Ignition System**
    - **Power Arc Ignition System**
- **Ignition Coils (Part V)**
  - **Contact (Breaker) Systems**

• <b>KM-01 Coil</b>	↔	<b>PM-05 Breaker/ Distributor</b>
• <b>UG-4048 Coil</b>	↔	<b>PM-05 Breaker/ Distributor</b>
• <b>B-11 Coil</b>	↔	<b>PM-05 Breaker/ Distributor</b>
• <b>B-2B Coil</b>	↔	<b>PM-05 Breaker/ Distributor</b>
• <b>B-201 Coil</b>	↔	<b>PM-11 or PM-302 Breaker</b>
• <b>B-204 Coil</b>	↔	<b>PM-302/302A Breaker</b>
- **Setting the Timing (Part IV)**
  - **Static Timing**
  - **Dynamic (Timing Light) Timing**

**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 (01/10)

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, UG-4085B (1950)	PM-05	3MT-7 (7A-hr) or 3MT-14 (14A-hr)
M-72M	1956-61	750cc	6-Volt	G-11A (1952)	PP-31A	KM-01	PM-05	
M-72K	1954-60	750cc	6-Volt	*Magneto*	None	-	PM-05	None
M-61	1958-60	650cc	6-Volt	G-11A (1952)	PP-30, PP-31A (1956)	B-11, KM-01	PM-05	3MT-12
M-62	1961-65	650cc	6-Volt	G-414 (1957)	PP-31	B-2B	PM-05	3MT-6 or 3MT-12
					PP-302, PP-302A	B-201, B-201A	PM-302, PM-302-01	
M-63 (Ural-2)	1965-68	650cc	6-Volt	G-414 (1957)	PP-302 (1963), PP-302A	B-2B	PM-11A	
						B-201, B-201A	PM-302, PM-302-01	
M-66 (Ural-3)	1968-72	650cc	6-Volt	G-414 (1957)	PP-302 (1963), PP-302A	B-201, B-201A	PM-302, PM-302-01	
M-67	1972-77	650cc	12-Volt	G-424 (1974)	PP-302A, PP-330	B-204	PM-302, PM-302-01	6MTS-9 or 2X 3MT-6
M-67.36	1976-95	650cc	12-Volt	G-424 (1974)	PP-330, 33.3702 (1992)	B-204	PM-302, PM-302A	
8.103 and 8.107 Series "650"	1994-98	650cc	12-Volt	G-424 (1974)	PP-330, 33.3702 (1992)	B-204	PM-302A (1982)	6MTS-9 or 6CT-18-36A (18-to-36A-hrs)
						BC3 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:

- M-64 (1961) and M-65 (1965) were prototypes.
- 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.
- M-73 (1976) was an M-72 (750cc) with engageable sidecar wheel.
- M-75 (1943) was experimental model with 500cc engine (6-Volt) on M-72 frame. M-76 (1947) was experimental (820cc).
- Г-424 alternator (150 Watts) has external relay/regulator (PP-302 or PP-330). 14.3771 and Nippon Denso alternators have internal regulators.
- 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.
- 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.
- 33.3702 Solid-State Voltage Regulator replaced the PP-330 in 1992.

**Table II: KMZ (KM3) - Dnepr (Днепр) Model/Year vs. Electrical System (01/10)**

<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</i>	<i>PM-05</i>	<i>3MT-7 (7A-hr) or 3MT-14 (14A-hr)</i>
<i>M-72N (H)</i>	<i>1957-59</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>1958-60</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-11A (1952)</i>	<i>PP-31A (1956)</i>	<i>B-2B, UG-4085</i>	<i>PM-05, PM-11A</i>	<i>3MT-7, -10, -14</i>
	<i>1960-63</i>			<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>		<i>B-201</i>	<i>PM-302, PM-302-01</i>
<i>K-750M (W)</i>	<i>1963-77</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>	<i>B-2B</i>	<i>PM-05</i>	<i>3MT-6</i>
						<i>B-201</i>	<i>PM-302, PM-302-01</i>	
<i>MT-12</i>	<i>1977-82 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>B-2B</i>	<i>PM-05</i>	<i>3MT-12</i>
						<i>B-201</i>	<i>PM-302, PM-302-01</i>	
<i>MW(MB)-750</i>	<i>1963-73</i>	<i>750cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963)</i>	<i>B-2B</i>	<i>PM-05</i>	<i>3MT-12</i>
						<i>B-201</i>	<i>PM-301/PM-302</i>	
<i>MW-750M (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>B-2B</i>	<i>PM-05</i>	<i>3MT-12</i>
						<i>B-201</i>	<i>PM-302, PM-302-01</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>B-2B</i>	<i>PM-05, PM-11A</i>	<i>3MT-12</i>
						<i>B-201</i>	<i>PM-302, PM-302-01</i>	
<i>K-650/MT-9</i>	<i>1971-77</i>	<i>650cc</i>	<i>6-Volt</i>	<i>G-414 (1957)</i>	<i>PP-302 (1963), PP-302A</i>	<i>B-2B</i>	<i>PM-05</i>	<i>3MT-6 or 3MT-12</i>
						<i>B-201A</i>	<i>PM-302, PM-302-01</i>	
<i>MW (MB)-650</i>	<i>1968-91</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B-204</i>	<i>PM-302A (1982)</i>	<i>6MTS-9 or 2X 3MT-6</i>
<i>MW (MB)-650M</i>		<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B-204</i>	<i>PM-302, PM-302-01</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>B-204</i>	<i>PM-302, PM-302-01</i>	
<i>MT-10.36</i>	<i>1975-84</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330</i>	<i>B-204</i>	<i>PM-302A (1982)</i>	
<i>MT-11 (Dnepr-11)</i>	<i>1983- 2005</i>	<i>650cc</i>	<i>12-Volt</i>	<i>G-424 (1974)</i>	<i>PP-330, 33.3702 (1992)</i>	<i>B-204</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>B-204</i>	<i>PM-302A (1982)</i>	

**Notes:**

1. MT-14 (1977) was a prototype.
2. MW-650 is military version of MT-16 and MW-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.

# Figure 1A: 6-Volt Electrical Systems (01/10)

**Motorcycle**

**Generator**

**Regulator**

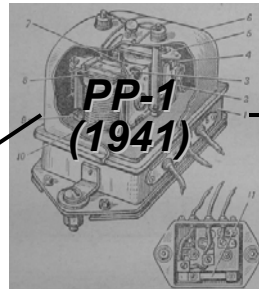
**Ignition Coil**

**Breaker/Distributor**

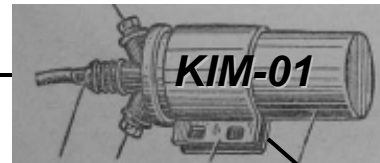
**Ural: M-72, M-72M, M-61  
Dnepr: M-72, M-72N**



**Г-11/11А: 45 W  
(1941/1952)**



**PP-1  
(1941)**



**KIM-01**



**PP-30**



**UG-4085B (1950)  
and B-11**



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

**Ural: M-62, M-63, M-66**

**Dnepr: K-750, K-750M, MB-750,  
MB-750M, K-650,  
MT-9, MT-12**



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



**B-2B**

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



**Г-414: 65 W  
(1957)**



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



**B-201/B-201A**



# Figure 1B: 12-Volt Electrical Systems (01/10)

**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**

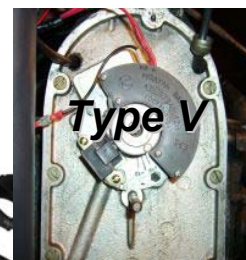
**(Relay-Regulator)**



**Contact-less**



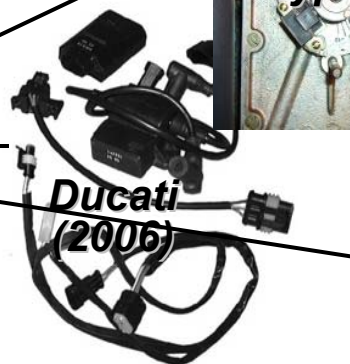
**Ural: IMZ 8.103 Series  
(1999-2003)  
Dnepr: None**



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



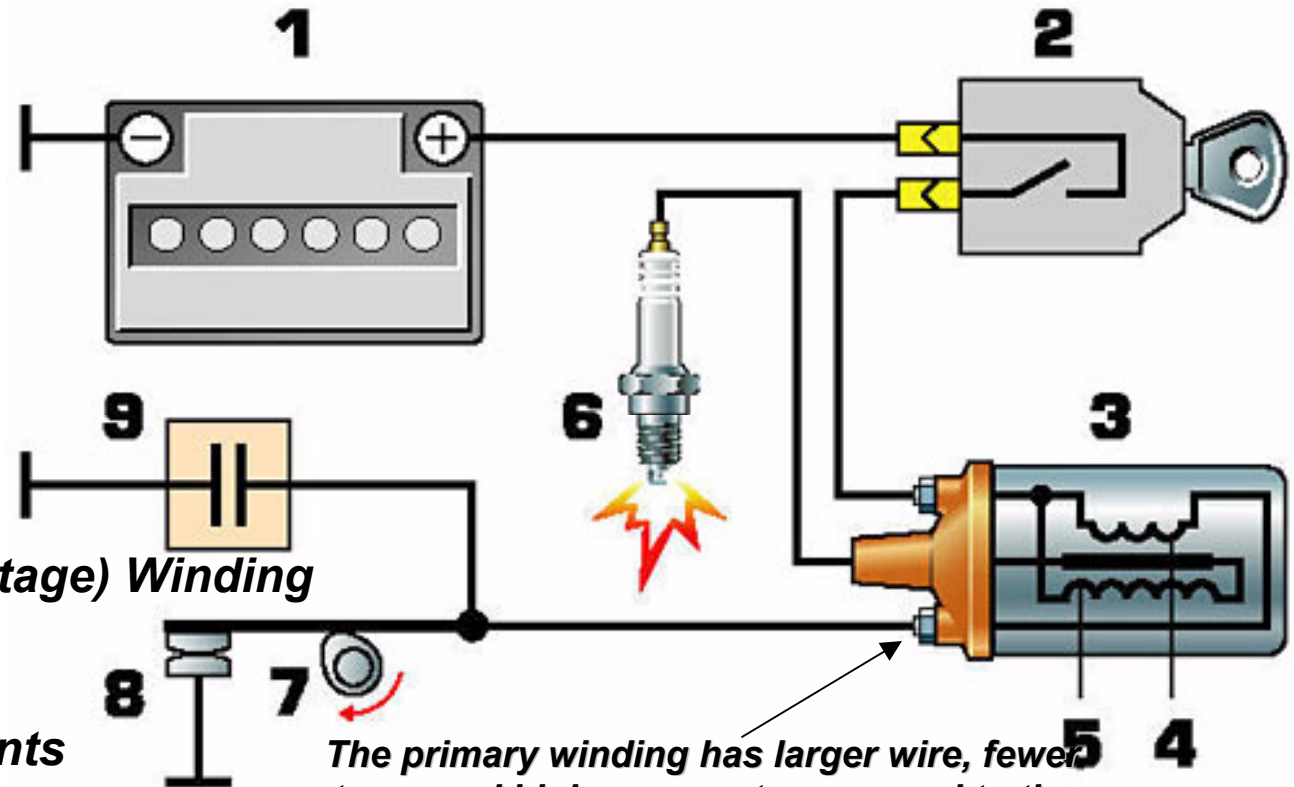
**Internal to Alternator**



**Raceway Services  
Power Arc**



# Basic Ignition System



1. Battery
2. Ignition Switch
3. Ignition Coil
4. Primary Winding
5. Secondary (high-voltage) Winding
6. Spark Plug
7. Rotating Cam
8. Contact Breaker Points
9. Capacitor (condenser)

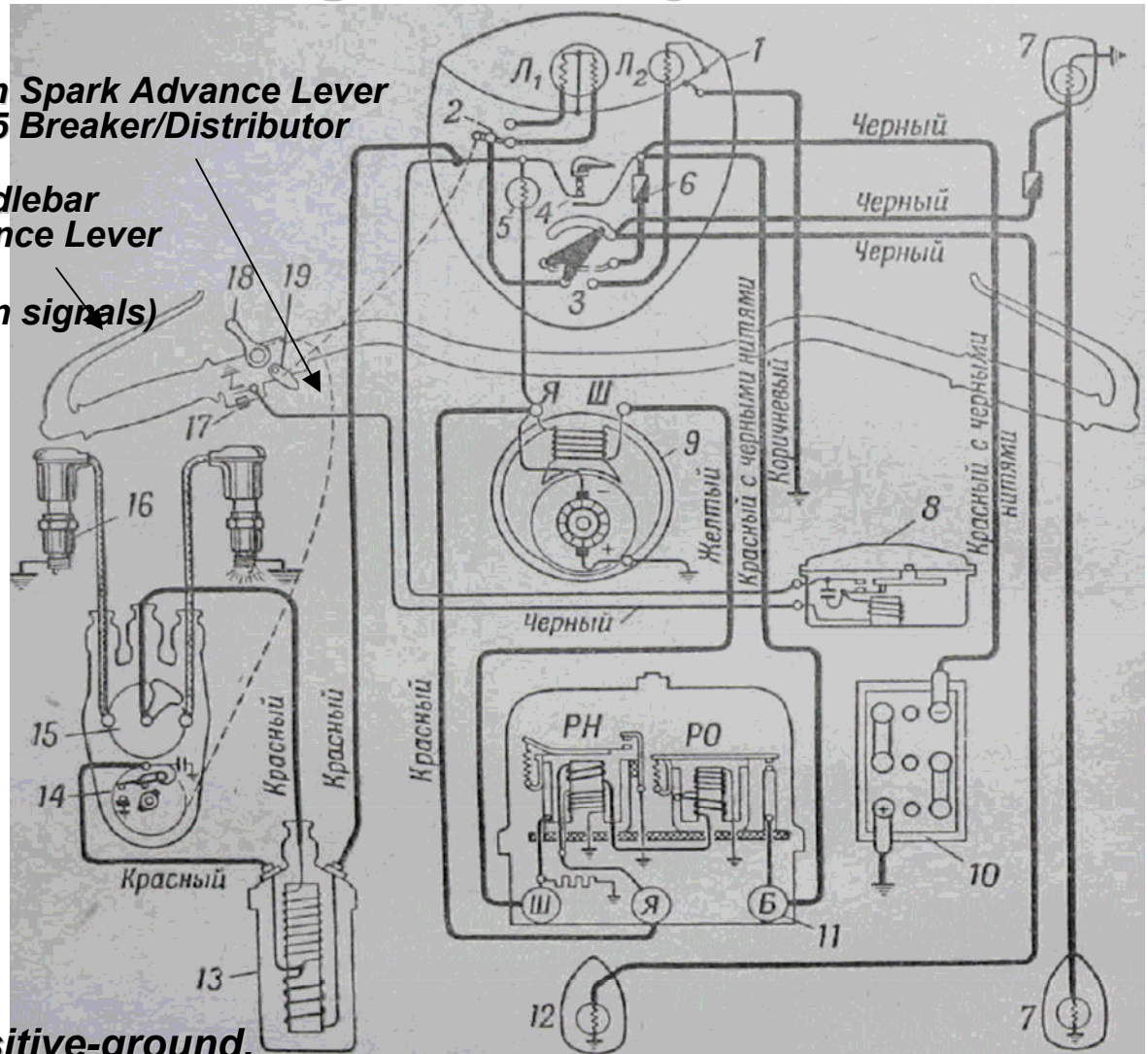
The primary winding has larger wire, fewer turns and higher current, compared to the multi-turn, finer wire, lower current of the high-voltage secondary winding.

**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 to the breaker/distributor.**