Ignition Systems for Russian Motorcycles
Part IV 3: Contact-Less (Electronic) Ignition Systems
Ernie Franke
eafranke@tampabay.rr.com
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## Table I: IMZ (ИМЗ) - Ural (Урал) Model/Year vs. Electrical System

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Engine Size</th>
<th>Voltage</th>
<th>Generator/Alternator</th>
<th>Regulator</th>
<th>Ignition Coil</th>
<th>Breaker/Distributor</th>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-72</td>
<td>1941-56</td>
<td>750cc</td>
<td>6-Volt</td>
<td>G-11, G-11A (1952)</td>
<td>PP-1, PP-31 (1950)</td>
<td>KM-01, B2B, IG-4085B (1950)</td>
<td>PM-05</td>
<td>3MT-7 (7A-hr) or 3MT-14 (14A-hr)</td>
</tr>
<tr>
<td>M-72M</td>
<td>1956-61</td>
<td>750cc</td>
<td>6-Volt</td>
<td>G-11A (1952)</td>
<td>PP-31A</td>
<td>KM-01</td>
<td>PM-05</td>
<td>None</td>
</tr>
</tbody>
</table>

Notes:
1. M-64 (1961) and M-65 (1965) were prototypes.
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. G-424 alternator (150 Watts) has external relay/regulator (PP-302 or PP-330). 14.3771 and Nippon Denso alternators have internal regulators.
### Table II: KMZ (KMЗ) - Dnepr (Днепр) Model/Year vs. Electrical System

<table>
<thead>
<tr>
<th>Model</th>
<th>Year</th>
<th>Engine Size</th>
<th>Voltage</th>
<th>Generator/Alternator</th>
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<th>Ignition Coil</th>
<th>Breaker/Distributor</th>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-72</td>
<td>1951-56</td>
<td>750cc</td>
<td>6-Volt</td>
<td>G-11A (1952)</td>
<td>PP-31 (1950)</td>
<td>KM-01, B-2B</td>
<td>PM-05</td>
<td>3MT-7 (7A-hr)</td>
</tr>
<tr>
<td>M-72N (H)</td>
<td>1957-59</td>
<td>750cc</td>
<td>6-Volt</td>
<td>G-11A (1952)</td>
<td>PP-31A (1956)</td>
<td>KM-01</td>
<td>PM-05</td>
<td>3MT-7-10, -14</td>
</tr>
<tr>
<td>K-750</td>
<td>1956-63</td>
<td>750cc</td>
<td>6-Volt</td>
<td>G-11A (1952)</td>
<td>PP-31A (1956)</td>
<td>IG-4085</td>
<td>PM-05, PM-11A</td>
<td>3MT-7-16</td>
</tr>
</tbody>
</table>

**Notes:**
1. MT-14 (1977) was a prototype.
2. MB-650 is a military version of MT-16 and MB-750 is a military version of the MT-12.
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
7. Г-424 alternator (150 Watts) has external relay/regulator (PP-302 or PP-330). 14.3771 (350 Watts) alternator has internal regulator.
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 the 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 the 750 engines, the Type IV was introduced. It featured 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 the Type V appeared, which is basically a Type IV split into 2 parts. The electronics were moved out into the airstream 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)

- 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.
The Type I ignition system had three main components; magnetic sensor, ignition module and ignition coil.
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 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 / БСЗ)
- Made in USSR: SOAKE (Stary 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.
The electronic ignition relies on a Hall-effect magnetic sensor to provide a timing signal to the electronic commutator (equivalent to breaker points).
The Type II contactless ignition fits Ural And Dnepr OHV (Over Head Valve) engines. With an operating range of 6 to 16-volts, it runs even when battery is deeply discharged.
Ignition Coil 12-Volt 135.3705 for Type II thru Type V Ignition Systems

- High-Voltage Output Terminals
- Safety Arc-Gap
- Mounting Ear
- Primary Winding Terminal Resistance: 5-Ohms

The 135.3705 later replaced the B204 as more contact-less (electronic) ignition systems were developed.
Type III (mid-1998) (http://sovietsteeds.com/forums)

- 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

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".
Contactless Ignition System of ignition

Contactless system of ignition 12V (135.3734)
Model: Dnepr 11/16, Ural
List Price: $49.95
(dnepr-kiev.com)
The Type III contactless ignition fits Ural And Dnepr OHV (Over Head Valve) engines. With an operating range of 6 to 16-volts, it runs even when battery is deeply discharged.
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.
Microprocessor-Based Electronic Ignition System
New Style Type III Electronic Ignition

- New Type Added LED for Timing
- New Light-Weight Rotor Made of Flat Plate
  - Fixes Old Problem of Rotor Breaking Up or Chattering and Damaging the Tabbed Washer
  - Potential Problem: No Positive Lock of Rotor Position, So It Can Slip
  - Careful Use of Loctite and Proper Tightening of Screw Will Keep in Position

- UKTUS Ignition
- 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
- Sparking 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 Electronic Ignition
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/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

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.

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

Type V Ignition Rotor with Swaged seam
Type V Ignition System (2004)

- 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
Ducati Ignition System (2007)

- 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 (2007-2013)**

<table>
<thead>
<tr>
<th>Ducati Ignition assembly IMZ-8.108-17008-07 (includes all below)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pick Up Without Support Plate,</strong>&lt;br&gt;Includes all brackets and hardware necessary to install ignition system</td>
</tr>
<tr>
<td><strong>Support plate for pickup</strong>&lt;br&gt;<code>IMZ-8.1037-17120-10</code></td>
</tr>
<tr>
<td><strong>Digital CDI</strong></td>
</tr>
<tr>
<td><strong>Ignition Coil and Wires Asy.</strong></td>
</tr>
<tr>
<td><strong>Rubber Holder</strong></td>
</tr>
<tr>
<td><strong>Support plate for Ignition</strong>&lt;br&gt;<code>IMZ-8.1037-17123-10</code></td>
</tr>
<tr>
<td><strong>Support bracket for CDI</strong>&lt;br&gt;<code>IMZ-8.1037-17016</code></td>
</tr>
<tr>
<td><strong>Ignition mounting set for pickup</strong>&lt;br&gt;<code>IMZ-8.1037-30026</code></td>
</tr>
<tr>
<td><strong>High-Voltage Cables with Caps Ignition Coil with Spark Plug Caps</strong></td>
</tr>
</tbody>
</table>

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**Spark Plug Cap Ducati**<br>532165770

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

• Part # for Entire Pick-Up assembly: 433138540
  – Does Not Include Support Plate
  – Includes All Brackets and Hardware Necessary to Install Ignition

• Replacement Pick-Up Sensor
  – ChenYang Hall-Effect Vane Sensor: CYHME-1AV
  – http://www.hallsensors.de/CYHME1AV.pdf
  – Supply Voltage/Input: 4.5-24V/≤9mA, Output: NPN (OC)
  – Alternative for: 1AV12F, 1AV11F, 1AV13F (Honeywell)

• Application Note:
  – Output Is Sinking Current (OC, open collector)
    • Pull-Up Resistor (1kΩ ~ 10kΩ) Should Be Connected Between Supply + and Output

![Diagram of CYHME1AV Sensor with connections: Vcc, GND, (OUT), (Vcc) with red, green, black, and red wires labeled]

+4.5V ~+24V
1kΩ ~ 10kΩ
Output signal

0V

Black  Green  Red  (GND)  (OUT)  (Vcc)
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.
Ural Power Arc Ignition System

• 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.
## Ural Gear-Up Ignition (2010-2013)

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ignition system kit</td>
<td>IMZ-8.1037-30027-10</td>
</tr>
<tr>
<td>4</td>
<td>Collar with seal</td>
<td>IMZ-8.108-01013-20</td>
</tr>
<tr>
<td>5</td>
<td>Hall sensor</td>
<td>IMZ-8.1037-17002-10</td>
</tr>
<tr>
<td>6</td>
<td>Ignition CDI</td>
<td>IMZ-8.1037-17013</td>
</tr>
<tr>
<td>7</td>
<td>Ignition coil</td>
<td>IMZ-8.1037-17010</td>
</tr>
<tr>
<td>16</td>
<td>Spark plug NGK BP7HS</td>
<td>IMZ-8.123-17003-10</td>
</tr>
</tbody>
</table>

Changes in rotor assembly are best handled at the ignition system assembly kit level, by ordering part # IMZ-8.1037-30025-12.
Changes in rotor assembly are best handled at the ignition system assembly kit level (1), by ordering IMZ-8.1037-30025-12.
Big change in 2014, when switching to EFI (Electronic Fuel Injection). Ignition coil for EFI is IMZ-8.1040-17010.
Big change in 2014, when switching to EFI (Electronic Fuel Injection). Ignition coil for EFI is IMZ-8.1040-17010.