Russian Regulators: Part VI
Voltage Regulator (126000-0600) for the Nippon-Denso
770-Watt Alternator

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12-Volt Regulator (N-D Part # 126000-0600) for the Nippon-Denso 55-Amp Alternator

• Background
  – Voltage Regulators Paired with Specific Generators/Alternators
  – Time-Line for Generators/Alternators/Regulators
  – Performance Specs for the Nippon-Denso (N-D) Alternator
  – Alternator Application in Ural Wiring

• What is it?
  – Internal (Built-In) Voltage Regulator for the Ural Nippon-Denso (N-D) Alternator
  – Completely Solid-State
  – Years of Application: 2004-to-Present
  – Retro-fittable to 14.377 (35-Amp) and Г-424 (11-Amp) Applications

• How Does It Work?
  – Regulates Alternator Output Voltage to 14.5-Volts
  – Provides Constant Voltage Regardless of Rotor Speed
  – Supplies Exciter Current to Vary Magnetic Field of Rotor

• Circuit Description and Operation

• Replacement
  – Widely Used in Nippon-Denso (Denso), Daihatsu, Kubota and Suzuki Alternators
  – Replacement Parts Readily Purchased On-Line

The Nippon-Denso 126000-0600 built-in, solid-state voltage regulator is a widely-used, reliable unit.
### Types of Generators/Alternators for Ural (Урал) and Dnepr (Днепр) (01/10)

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<table>
<thead>
<tr>
<th>Generator/Alternator</th>
<th>Type</th>
<th>Vintage</th>
<th>Nominal Voltage</th>
<th>Current</th>
<th>Nominal Power</th>
<th>Regulator</th>
<th>Motorcycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Г-11 (G-11)</td>
<td>DC Generator</td>
<td>1941-1951</td>
<td>6-Volt (7-Volt)</td>
<td>7-Amp</td>
<td>45-Watts</td>
<td>PP-1 PP-31 (1950)</td>
<td>Ural (IMZ)</td>
</tr>
<tr>
<td>Г-11A (G-11A)</td>
<td>DC Generator</td>
<td>1952-1957</td>
<td>6-Volt (7-Volt)</td>
<td>7-Amp</td>
<td>45-Watts</td>
<td>PP-31 (1950) PP-31A (1956)</td>
<td>M-72, Not Used</td>
</tr>
<tr>
<td>Hitachi (Limited Appearance)</td>
<td>Alternator/ Starter</td>
<td>1998-1998.5</td>
<td>12-Volt (14-Volt)</td>
<td>18-Amp</td>
<td>300-Watts</td>
<td>Internal to Alternator?? IMZ 8.103 and 8.107 “650” Series</td>
<td>Not Used</td>
</tr>
<tr>
<td>Nippon Denso (P/N: IMZ-8.1037-16092)</td>
<td>Alternator (Built-in Rectifier &amp; Regulator)</td>
<td>2004-present</td>
<td>12-Volt (14-Volt)</td>
<td>55-Amp</td>
<td>770-Watts</td>
<td>Internal to Alternator (126000-0600) IMZ 8.103, 8.103X, 8.123, 8.123X “750” Series</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

**Notes:**
1. **Nomenclature:** The Cyrillic letter “Г” transliterates (Russian-to-Latin) to “G” or “L” or “T.” Thus we see Г-414 or G-414 or L-414 or T-414, all for the same part.
2. Cannot use Alternator with discharged battery or without battery.

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**Regulators are paired with specific generators/alternators.**
### Recent Ural Starter/Generator/Alternator Time-line (01/10)

<table>
<thead>
<tr>
<th>Year</th>
<th>Engine Size</th>
<th>Start Relays (RY-115)</th>
<th>Ignition Type</th>
<th>Voltage Regulator</th>
<th>Gen/Alt</th>
<th>Voltage</th>
<th>Engine</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>1999</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2001</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2002</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2003</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2004</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2006</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>750 cc Engine</td>
<td>New Engine Design (Alternator on top / Flywheel Starter placed on bottom)</td>
<td>Type II</td>
<td>Type III Ignition</td>
<td>Regulator Internal to Alternator</td>
<td>Voltage Regulator internal to Alternator</td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Ural imported to U.S. by CSMI (Classic Motorcycles and Sidecars, Inc.)
- Factory Electric-Start (E-Start) Option & Retrofit introduced by CSMI
- No points-ignition Urals Approved for U.S. sale
- Type I
- Type II
- Type III Ignition
- Type IV (Type IV with electronics moved into airstream)
- Type V
- Voltage Regulator Internal to Alternator
- New Transmission Case (Flywheel Starter Added, New Wiring Harness) (IMZ-8.1037-18016-12)
- New Wiring Harness (9238000)
- One Relay
- Two Relays
- 35 Amp Russian Alternator: 14.3771 (Hand Grenade) (500 W, black-plastic rear cap)
- 55 Amp Nippon Denso Alternator (770 W, metal rear cap)
- (Increased length by 20 mm)
**Nippon-Denso 12-Volt Alternator** (01/10)

- **14-Volt / 55-Ampere / 770-Watt Alternator** (actually rated at 43-Amp)
- **Used on:**
  - Ural: 8.103, 8.103X, 8.123, 8.123X, “750” Series
  - Dnepr: Not Used (retro-fittable to Г-424 applications)
- **Built-In Voltage Regulator**
- **P/N for Alternator-Only** (minus cushion adaptor): 100211-1680
- **Current Rating for 100211-1680 Alternator:**

<table>
<thead>
<tr>
<th>Engine (Crankshaft) Speed</th>
<th>Alternator (Rotor) Speed</th>
<th>Output Current</th>
<th>Motorcycle Speed (mph / kmph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>340-to-450 rpm</td>
<td>450-to-600 rpm</td>
<td>“Fault” Light Extinguishes</td>
<td>Idle</td>
</tr>
<tr>
<td>2,025 rpm</td>
<td>2,700 rpm</td>
<td>30-Amp</td>
<td>22 mph / 35 kmph</td>
</tr>
<tr>
<td>2,250 rpm</td>
<td>3,000 rpm</td>
<td>34-Amp</td>
<td>24 mph / 38 kmph</td>
</tr>
<tr>
<td>3,000 rpm</td>
<td>4,000 rpm</td>
<td>40-Amp</td>
<td>32 mph / 51 kmph</td>
</tr>
<tr>
<td>3,750 rpm</td>
<td>5,000 rpm</td>
<td>43-Amp</td>
<td>40 mph / 64 kmph</td>
</tr>
<tr>
<td>5,250 rpm</td>
<td>7,000 rpm</td>
<td>46-Amp</td>
<td>56 mph / 90 kmph</td>
</tr>
<tr>
<td>-</td>
<td>&gt;7,000 rpm</td>
<td>Not Much Increase above 50-Amp</td>
<td>&gt;56 mph / 90 kmph</td>
</tr>
</tbody>
</table>

**Nippon-Denso’s 100211-1680 alternator is nominally rated at 43-amps @ 5,000-rpm, corresponding to a motorcycle speed of 40-mph (64 km/hr).**
**Nippon-Denso Installation Wiring Diagram**

- **B+ Battery**: Main current connection - connect to the battery positive via heavy duty wire.
- **IG**: Ignition - connect to ignition switched +12V, provides about 0.25-Amp to drive the regulator.
- **L**: Lamp - connect via the warning lamp to +12v.
- **Access Hole for Terminal “F” of Rotor**: Grounding the “F” terminal gives “full-field” for testing.

“Fault” Light is Optional on N-D Alternator (note: light was mandatory for initial rotor current in previous 14.3771 35-Amp alternator (Russian hand grenade))

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**Three connector Alternator**

- **Battery**
- **Fusebox**
- **Ignition Light**
- **Starter**
- **Switched Live**
- **B+**
- **Access Hole for Terminal “F” of Rotor**
The voltage regulator is the brain of the charging system, monitoring both battery and stator voltages. Depending on the measured voltages, the regulator will adjust the amount of rotor field current to control alternator output.
Inside the Nippon-Denso Voltage Regulator

The regulator controls the amount of battery current going to the field winding in the rotor.
**Ural 750 Starter / Alternator Circuit (2004-2005) ver. 2.0 (01/10)**

**Notes:**
1. Two Start Relays (RY-115)
2. In-Line Fuse #1 deleted mid-2005

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### Right Handlebar
- **Momentary “Start” Button**
  - grn / red
  - “Start” switch
  - red
  - “Run” switch
  - pnk / blk

### Headlight Cavity
- **Neutral Switch (on transmission)**
- **Green (Neutral)**
- **Red (Alternator Fault)**

### Ignition Switch
- 6 5 1 2 3

### 9-pin Connector
- (+12V. in “Run” position)
- top
- bottom

### In-Line Fuse #1
- 85 86 30 87

### 55 Amp Nippon Denso Alternator
- IG (ignition)
- L (lamp)

### Starter Solenoid
- white
- large grey
- large black

### Starter Motor
- CHASSIS GROUND
- Pos +
- Neg -

### Fuse Block
- 4 3 2 1

### Brakes
- Headlites
- Run Lites

### Connectors Pin
- Terminal
- Male ➔ Female

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**Notes:**
1. In-Line Fuse #1 (15A) for Turn Signal and Neutral Indicator Lamp.
2. Fuse Block #4 Fuse (5A) for Ignition & Electric Start Relays.

(+12V. when Ignition Switch on “Run”)

**Chassis Ground**

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**Alternator**
- Pos +
- Nippon Denso
- Green (Neutral)
- Red (Alternator Fault)

**Ignition Switch**
- Momentary “Start” Button
- “Run” switch
- “Start” switch

**Neutral Switch**
- on transmission

**Headlight Cavity**
- Green (Neutral)
- Red (Alternator Fault)

**Ignition Key**
- black white

**Fuse Block**
- 4 3 2 1

**Brakes**
- Headlites
- Run Lites

**Connectors Pin**
- Terminal
- Male ➔ Female

---

**Alternator**
- Pos +
- Nippon Denso
- Green (Neutral)
- Red (Alternator Fault)

**Ignition Switch**
- Momentary “Start” Button
- “Run” switch
- “Start” switch

**Neutral Switch**
- on transmission

**Headlight Cavity**
- Green (Neutral)
- Red (Alternator Fault)

**Ignition Key**
- black white

**Fuse Block**
- 4 3 2 1

**Brakes**
- Headlites
- Run Lites

**Connectors Pin**
- Terminal
- Male ➔ Female
Ural 750 Starter / Alternator Circuit (2006-2007) ver. 2.0 (01/10)
(Electrex, Inc. Rev. E, 2006 GPTT, 2006 & 2007 Owners Manuals) eafranke@tampabay.rr.com

Notes:
1. Single Start Relay (RY-115)
2. ND Alternator added 2004
3. In-Line Fuse #1 Deleted mid-2005

Right Handlebar
- Momentary “Start” Button
- Rocker-Arm “Run / Kill” Switch

Headlight Cavity
- 10-pin Connector
- Ducati Ignition Module

Starter Solenoid
- Electric Start Relay (Normally Open)

Starter Motor
- Nippon Denso Alternator

Note: # in front of wire color is AWG wire size.
Parts for NIPPON-DENSO Ural / Dnepr 12-V / 40-A Alternator

Parts for the Nippon-Denso 12-Volt alternator are readily available from Tiedemann Auto-Elektric (Denmark) at www.auto-elektrik.de and Metro Auto Industrial, Pomona, CA at www.metroautoinc.com.
Voltage Regulator for the Ural 100211-1680 Alternator

- 12-Volt Voltage Regulator
- Output Voltage Set Point: 14.5-Volts
- Repair Circuit: VR-H2005-26S; TRI254
- Terminal Markings" IG (ignition) and L (lamp)
- Low/High Speed RPM Charge Point (lamp on/off): 450/ 600 rpm Rotor Speed
- Ambient Operating Temperature (full load): -40°C to +135°C (-40°F to +275°F)
- Alternator Series: IR / IF (internal Regulator / Internal Fan)
- Soft-Start for Field
- Load Control: “Y” and Load Response: 7 sec
- Principal Use: Fork-lift and Industrial
- N-D Alternators Shut Down for:
  - Over-Voltage
  - Shorted “B” Lead
  - High Field Current (over-load)
  - Warning Light Will Illuminate

The questionable 14.3771 alternator was replaced with a Nippon-Denso (N-D) alternator, adding to Ural’s reliability.
Nomenclature for Nippon-Denso (N-D) Alternator

- **Ural Announced:** Starting January 2004, Motorcycles Equipped with DENSO 100211-1680 (Japan), with Built-In Regulator
- **Consists of N-D 100211-680 Alternator plus Cush Adapter Unit**
- **Alternator Used In:**
  - Line of Toyota Forklift Trucks
  - Ford, Kubota, New Holland Light Tractors
  - Thermo King AG & Industrial
  - Daihatsu Charadl Vehicle
  - Chevrolet Sprint 1.0L (1988-87)
  - Suzuki Samurai 1.3L (1995-86) and Sidekick 1.3L (1989)

- **Alternator (pulley-version, instead of Ural adapter) Used In:**
- **Voltage Regulator OEM#'s:** Nippon-Denso Part# 126000-0600
  - Replaces:
    - Toyota 27700-78301
    - Iseki 281-271-001-0
    - Daihatsu 27700-96301, 27700-87207
    - Victory A8062902

- **Voltage Regulator 27700-96301 Used In:**
  - Alternators:
    - Ishikawajima 18504-6220
    - Mitsubishi MD604589
    - Nippon-Denso 100211-1550, 1670, 1680
  - Vehicles:
    - Daihatsu
    - Mitsubishi
    - Subaru
    - Suzuki
    - Toyota

**Parts for the Nippon-Denso 12-Volt alternator (minus the cushion adapter) are readily available.**
Voltage Regulation Process

- Regulator Maintains pre-Determined Charging Voltage Level: 14.5-V
- When Charging Voltage Falls below this Point, Regulator Increases Field Current, thus Strengthening the Rotating Magnetic Field, Resulting in Increased Alternator Output
- When Charging Voltage Rises above this Point, Regulator Decreases Field Current, thus Weakening the Magnetic Field, Resulting in Decreased Alternator Output

The regulator monitors the battery voltage, controlling current flow to the rotor assembly. The rotor produces a magnetic field, which induces voltage into the stator. The rectifier bridge converts AC stator voltage to DC output for use by the motorcycle.

A Peek inside the Alternator

• Removing the Rear Case Reveals:
  – Rotor Winding Assembly, which Rotates inside Stator Winding
  – Rotor Generates a Rotating Magnetic Field
  – Stator Winding Develops Voltage
  – Current Begins to Flow from Induced Magnetic Field of the Rotor

• As the Rotor Assembly Rotates within the Stator Winding:
  – Alternating Magnetic Field from the Spinning Rotor Induces an Alternating Voltage into Stator Winding
  – Strength of the Magnetic Field and Speed of the Rotor Affect the Magnitude of Voltage Induced into Stator

Removal the rear cover of the N-D alternator reveals the rotating magnetic field coil surrounded by the stationary three-phase winding.
Rotor Assembly

- **Basic Rotor Consists of Iron Core, Coil Winding, Two Slip-Rings, and Two, Inter-leaved, Claw-Shaped Finger Pole-Pieces**
- **Rotor Contains Field Winding Wound over Iron Core**
- **Surrounding the Field Coil are Two Claw-Type Finger-Poles**
- **Each End of Rotor Field Winding Attached to a Slip-Ring**
- **Stationary Brushes Connect Alternator to the Rotor**
- **Magnetic Field Saturates the Iron Finger-Poles**
- **One Finger-Pole becomes a North Pole and Other a South Pole**
- **Rotor Spins Creating Alternating Magnetic Field; North, South, North, South, etc.**

The rotor (exciter) field winding creates the rotating magnetic field that induces voltage into the stator winding.
Stator Windings

- Stator Composed of Three Sets of Windings
- Each Winding Placed in Different Position Compared with the Others, Staggered 120° Apart
- Laminated Iron Frame Concentrates the Magnetic Field
- Stator Lead Sends Output Current to Diode Rectifier Bridge
- Neutral Junction in the Wye (Y) Identified by the 6 Strands of Wire

Wye style has four stator leads. One of the leads is called the Neutral Junction, common to all the other leads.

The induced AC voltage in each lead of the stator winding is fed to the diode rectifier assembly to convert to DC.
Diode Rectifier Bridge Assembly

- Two Rectifier Diodes Connected to each Stator Lead
- Six Diodes used to rectify the AC stator voltage to DC Output Voltage
- Full-Wave Rectification: Diodes Redirect both Positive and Negative Polarity AC Voltage to Produce DC Voltage

The Diode Rectifier Bridge is responsible for the rectification of AC voltage to DC voltage.
Slip-Rings and Carbon Brushes for Exciter Rotor

Two slip rings are located on one end of the rotor assembly. Each end of the rotor field winding is attached to a slip ring, allowing current to flow through the field winding.

Two stationary carbon brushes ride on the two rotating slip rings.

Power for the rotor (exciter) coil is supplied, through the carbon brushes and slip-rings, by the voltage regulator.