Ural (Урал) - Днепр (Днепр) Electric Starters for Russian Motorcycles Part XI: Electric Starter Evolution

Ernie Franke eafranke@tampabay.rr.com 09 / 2017
Electric Starter History

- Ural Was Only Kick-Start When Bikes Were Imported to USA in 1994 thru 1997
  - CSMI (Classic Motorcycles and Sidecars, Inc) Replaced 14-Amp Russian (Г-424) Generator with 18-Amp Hitachi Starter-Generator on Imported Urals in 1998
  - See Part II: Hitachi Starter Generator
  - Did Not Work Well and Discontinued Almost as Soon as Introduced
    - Starter-Generator on Top of Motor, Working Off the Timing Gear Set
    - Inadequate Charging and Inadequate Starter
- Ural Added a True Starter-Motor in 1998-1/2
  - Modified Bell Housing of Gearbox to Accept a Real Starter
  - Starter Required Larger Battery and 35-Amp Alternator (14.3771)
  - Used Starter CT369, Originally Developed for Russian Outboard Engine
  - '98 Models Sold With and Without Starters until Non-Starter Inventory Depleted
  - 35-Amp Alternators (Russian Hand-Grenade) Started Failing, but There Wasn't Any Replacement at that Time
    - In 2004, 55-Amp Nippon Denso Alternator Replaced 35-Amp Russian Grenade
- Starter-Motor Design Changed to CT369Е Version around 2006
  - Lengthened by 22 mm (approx. 1”) for 30% Reduction in Current Consumption
  - Production Bikes Equipped with Proper Kick-Start Levers (1” Kink in Lever)
  - Problem Only for Older Replacements: Need to Modify Levers
    - Interference Fit with Kick-Start Lever
    - F2 (England) and Gene Holopaw Offered Modified Levers
- Schematics of Urals with Starters Included
  - See Part IV for Hitachi Starter / Generator Schematic
- Dnepr Never Manufactured a Bike with Electric Start, Only Retro-Fit Kits
The starter-motor is bolted to the gearbox flange and engages the geared flywheel on the engine.
Pre-1998 Ural 650s without Electric-Start

Prior to 1998, Urals only had foot kick-start.

1993 Ural Tourist

Г-424 Generator

Ural 650 cc

No Electric-Start
After 1998, Urals only had optional electric-start for their 650’s.
With the conversion to 750cc in 2003, electric-start was standard.
Ural Starter-Motor Derived from Popular Russian Outboard Engine

• Outboard Motors "Whirlwind" (Vortex) Popular in USSR
  – "Whirlwind-25" (Вихрь-25) and "Vortex-30" (Вихрь-30): 25 and 30 Hp

The CT369 starter is used in the Whirlwind (Vortex) outboard engines, popular in the USSR and built in Irbit (home-town of Ural).
The CT369 (ST-369) is manufactured by Electromash in the Ukraine.

Company Electromash founded in 2002
- E-mash (Эл-маш)

Only Ukrainian designer and manufacturer of starters and alternators for automotive, tractor and motorcycle engines, motor vehicle electric cooling fans and tractor magnetos.

The CT369 starter engages the flywheel of the Vortex 30 Hp outboard engine.
Original Electric Starter CT369 (ST369)

- Four-Pole DC Motor
- Single-Wire Supply with a Return thru Ground or Chassis
- Consists of a Body (1), Attached to Pole Field Coils (2), Drive Cover (3), Commutator Cover with Brush Holder (4), Rotor or Armature (Anchor) (5), Ring Collector (Commutator) (6), Drive Gear (7) and Relay Solenoid (8)

1. Body
2. Pole with Field Coils
3. Drive Cover
4. Commutator Cover
5. Motor Anchor (Rotor or Armature)
6. Ring Type Collector (Commutator)
7. Drive Gear
8. Traction Relay
9. Relay Anchor (Armature)
10. Lever
11. Rod or Stem
12. Movable Contact
13. Terminal
14. Terminal Lug
15. Return Spring
16. Return Spring

The CT369 solenoid pulls the lever (10), which engages the starter drive gear (7) into the motorcycle’s flywheel gear.
Electric Starter, 12-V (Ural)
Part #: IMZ-8.124-18075-10
Vendor ID: 003.899
List Price: €180.00
(www.oldtimergarage.eu)

The earliest CT369 was the shorter electric starter for Urals.

On the Earlier Version (CT369), the Terminals Are Nearly Flush (10mm) with the End-Cap.

Inscription: IMZ-8.124-18075-10
Inscription: 320.3708
Old & New (Longer) CT369 Diagram (www.electromash.com.ua)

The End-Cap of the Later Version (CT369Б) Extends about 25mm Beyond the Electrical Terminals. On the Earlier Version (CT369), the Terminals Are Nearly Flush (10mm) with the End-Cap.

End-Cap of Later Version (CT369Б) Extends 25mm Beyond Electrical Terminals.

The new starter may not have any problem fitting in the Russian outboard motor, but the extra length of the starter interferes with the Ural kick-start lever.
Electric Starter 391.3708 for Russian VAZ-1111 "OKA" Car (Manufacturer Electromesh)

The 391.3708 or 7102.3708 starter-motor, as seen on the Internet, is used in the Russian VAZ-1111 "OKA" car, and will not fit the mounting holes of the Ural.

1111-3708800: Starter Solenoid for VAZ-1111 Starter
Ural Electric-Start Motor Has Various Designations

- **Original “A” Version of CT369**
  - Alternate Transliteration: ST369
  - Ural Part #: IMZ-8.103-18075 (ИМЗ-8.103-18075)
    - 650/750cc, 2003 - 2006 Parts List
      - Ural Part #: IMZ-8.124-18075-10 (ИМЗ-8.124-18075-10)
      - Electromash Part #: 320.3708
      - Electromash Part #: 392.3708
  - 650/750cc, 2003 - 2006 Parts List
    - Electromash Part #: 369Б.3708

- **Replacement “B (Б)” Version: CT369Б**
  - Alternate Transliteration: CT369B or ST369Б
  - Ural Part #: IMZ-8.103-18075 (ИМЗ-8.103-18075)
    - 650/750cc, 2007 - 2010 Parts List
      - Ural Part #: IMZ-8.124-18075 (ИМЗ-8.124-18075)
        - 650/750cc, 2009 and 2011 Parts List
          - Electromash Part #: 369Б.3708

- **Possible Russian Starter (Add-On, Requires Modifications)**
  - Use OKA (Ока) Starter for Lada VAZ-1111 (ВАЗ 1111) Car
  - VAZ-1111: Basic Russian Car with a 2-cylinder, 750cc, 35 Hp Engine
    - Part #: 391.3708 or 39.3708

Hang on, as we gyrate between forums, web-sites and manuals to recover Russian motorcycle, electric-start history.
VAZ-1111 "OKA" Starter
(Sold by Some as an “Add-On” Electric-Start, Requires Modifications)

Even though it can only be used as an add-on after mechanical modifications to the Ural, the VAZ-1111 starter-motor serves as an illustration for the CT369.

Type 39.3708 / 391.3708 Starter-Motor:
1. Freewheel
2. Stop Ring
3. Gear
4. Drive Cover
5. Lever
6. Relay Armature
7. Holding Relay Winding
8. Pull-In Relay Winding
9. Contact Plate
10. Relay Cover
11. Terminal Bolts
12. Cover
13. Commentator
14. Back Cover
15. Brush
16. Housing
17. Pole
18. Rotor or Armature

Wiring Diagram:
1. Battery
2. Starter
3. Starter Relay
4. Ignition Switch
### Specs on 12-Volt Starter Motors Used in Urals

<table>
<thead>
<tr>
<th>Designation</th>
<th>CT369 (ST369) 369.3708, 320.3708 IMZ-8.124-18075-10</th>
<th>CT369B (ST369B) 369.3708</th>
<th>CT362A / 392.3708</th>
<th>391.3708 or 39.3708</th>
<th>7102.3708 (similar to 391.3708)</th>
<th>1111.3708 (similar to 391.3708)</th>
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<tr>
<td>Company</td>
<td>Electromash</td>
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<td>Katek</td>
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<td>Location</td>
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<tr>
<td>Rated Power</td>
<td>0.552 kW</td>
<td>0.61 kW</td>
<td>0.67 kW</td>
<td>0.9 kW</td>
<td>0.95 kW</td>
<td>0.92 kW</td>
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<td>Nominal Voltage</td>
<td>12-Volts</td>
<td>12-Volts</td>
<td>12-Volts</td>
<td>12-Volts</td>
<td>12-Volts</td>
<td>12-Volts</td>
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<td># of Gear Teeth</td>
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<td>Gear Pressure Angle</td>
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<td>20°</td>
<td>12°</td>
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<td>Direction of Rotation</td>
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<td>Weight</td>
<td>4.5 kg</td>
<td>4.25 kg</td>
<td>4.4 kg</td>
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<td>Diameter</td>
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<td>80 mm</td>
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<td>Overall Length</td>
<td>224.5 mm</td>
<td>239.5 mm</td>
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<td>207 mm</td>
<td>234 mm</td>
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<td>Length (front flange to end of Bendix)</td>
<td>67 mm</td>
<td>67 mm</td>
<td>67 mm</td>
<td>63.5 mm</td>
<td>63.5 mm</td>
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<td>Gear Module (starter drive or pinion)</td>
<td>2.5 mm</td>
<td>2.5 mm</td>
<td>2.5 mm</td>
<td>2.12 mm</td>
<td>2.12 mm</td>
<td>2.12 mm</td>
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<td>Length (from front flange to end cap)</td>
<td>157.5 mm</td>
<td>172.5 mm</td>
<td>157.5 mm</td>
<td>143.5 mm</td>
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<td>Distance between Mounting Holes</td>
<td>105 mm</td>
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<td>114 mm</td>
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<td>Diameter of Mounting Holes</td>
<td>10.5 mm</td>
<td>10.5 mm</td>
<td>10.5 mm</td>
<td>11.2 mm</td>
<td>11.2 mm</td>
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The 391.3708, 7102.3708 and 1111.3708 are not exact-replacement starter-motors for the Ural. The mounting holes, gear angle and Bendix length are different.
The CT362A (0.67 kW) is more powerful than the CT369 (0.552 kW).
The CT362A (0.67 kW) is more powerful than the CT369 (0.552 kW).
The High Torque and Poor Metallurgy Accounts for the Cracked Bell on My Electric Starter (2003 Patrol)

CT369
Another Ural Starter (CT369) Failure

- Bell Housing on 750cc Electric Starter Cracked
- New Starter from Stock Is Longer than Previous Starter
- Kick-Start Lever Interferes with Electric Starter Body

On the Earlier Version (CT369), the Terminals Are Nearly Flush (10mm) with the End-Cap.

Several folks have experienced starter-motor casing failures. The choice is between welding the casing back together or purchasing a new, longer starter-motor, CT369Б.
The CT369Б (ST-369Б) was added by Ural as the IMZ-8.124-18075 (ИМЗ-8.124-18075) and was used on 650’s, as well as 750’s.
CT369Б (CT369В) Later Version of Starter Motor for Ural

The End-Cap of the Later Version (CT369Б) Extends about 15 mm Beyond the Electrical Terminals.

Inscription: СТАРТЕР (Starter) 369Б

Electrical Starter for Ural Motorcycle, All Models
Part #: IMZ.1037-18075
Vendor #: 271165375999
List Price: $224.00
(compare.ebay.com)

369Б.3708

The “.3708” is merely the govt. engineering group code for starters, not really necessary.
### Modified Kick-Start Levers

- Factory-Supplied, Replacement Motors (CT369Б) are about 1” longer than the Original CT369 Starter Motors
- No Problem for Russian Outboard Engines (Major Market) – Plenty of Leg-Room in Outboard Engine Compartment
- Three Options for the Longer Starter-Motor on Urals – Remove the Kick-Start Lever Completely (E-Start, No Kick-Start)
  - F2 Motorcycles Ltd, Can Supply the New, Longer Starter-Motor with a New Kick-Start Lever
  - Gene “Holopaw” Actually Heated-Up a Kick-Start Lever and Bent One for Me (good job and nice price)
- Starter-Motor Comes with Factory Spacer Plates (two shim plates) and Care Must Be Taken When Fitting to Ensure the Teeth Engage Properly with the Flywheel (try some white graphite)

**Electric Starter - Long.** The longer motor is current fitment to all electric start Urals. It can be fitted as a replacement for the earlier short type motor, but you will require a new kick-start lever with a greater offset to clear the back of the starter motor.  

Part #: F24320/LONG  
List Price: £245.00  
(www.f2motorcycles.ltd.uk)
The CT362 starter-motor, also seen on the Internet, mounts on the flange of the gearbox, just as the CT369.
Starter-Motor CT-362A (ST-362A)

- Electric Starter-Motors for Russian Tractors and Special Equipment
- Model 362 (ST362A) At 12 volts.
- 37.003.084-88 Production Ukraine
- 1993 Release
The CT362 starter-motor has been discontinued.
Starter-Motor 3708 CT-362

1. Relay cover
2. Gasket
3. Spring
4. Lock washer
5. Washer
6. Bar
7. Washer
8. Washer
9. Spring
10. Washer
11. Bolt pin
12. Stock
13. Nut
14. Washer
15. Yoke
16. Spring
17. Housing
18. Anchor (Movable Core)
19. Lever
20. Gasket
21. Cover
22. Washer
23. Lever Axis
24. Pin
25. Screw
26. Insert (d=9mm, D=13.8, L=13mm)
27. Washer
28. Washer
29. Ring
30. Ring
31. Gear
32. Spring
33. Cup Sleeve
34. Washer
35. Bearing Cup
36. Ring
37. Insulated Brush
38. Anchor
39. Brush Holder
40. Brush Bare
41. Insert d= 9mm, D= 13.8, L= 13mm
42. Ring
43. Cover
44. Spring Brush
45. Gasket
46. Cap
47. Bolt
48. Washer
49. Washer
50. Screw
51. Washer
52. Nut
53. Nut
54. Washer
55. Finger
56. Bolt M10x30
57. Washer
Servicing the CT362 (ST362) (tractor-mtz80-mtz82.ru)

- Service after 1920 hours of Operation
- Follow These Steps:
  a) Dismantle the Starter.
  b) Check the Status of the Switch and Clean Them of Dust and Dirt Using Fsuper-Fine Sandpaper
  c) Wipe Collector (Commutator) (11) with a Clean Cloth manifold (11), Soaked in Gasoline
  d) Check Condition of Brushes (5)
    - Brush Should Fit the Entire Face of the Commutator and Move Freely in the Brush Holders
    - Check the Pressure Springs on the Brushes
  e) Force Measured by a Dynamometer Should Be between 1000-1400 gauss (10-14 h)
  f) Oil (Lubricate) the Starter, Neck and Shaft Splines, Thrust-Washers, Pins and the Axis of the Lever
  g) After Assembly, the Gap between the End of the Drive Gear (1) and Thrust Ring (10) on the Armature Shaft (9) when the Solenoid position and the selected actuator backlash toward the collector Needs to be 2 mm. (The gap is not adjustable)
  h) Checking the Starter Idling Current to Consume Less than 50-Amps, while the Speed of Rotation of the Armature Should Be Less than 5,000 rpm
  i) Starter Armature Rotates in Two Bearings, Pressed in the Cover
  j) Two Insulated and Non-Insulated Brush Holder
  k) Engagement with the Flywheel Gear and Transmission of Torque from the Starter to Engine Are Carried Out by Drive Roller (7) Moving Along Helical Slots in the Armature Shaft (9)
  l) Engaging the Gear with the Flywheel Is Caused by a Lever (2) Connected with a Spring-Loaded Solenoid Core

1. Engaging (Drive) Gear
2. Lever
3. Earring
4. Spring
5. Brushes
6. Contact Bolts
7. Drive Coupling
8. Cover
9. Armature Shaft (Rotor)
10. Thrust Ring
11. Collector (Commutator)
Kick-Start Levers and Bell for Ural Electric Starters

- Kick-Start Lever for IMZ-8.124-18075 (650/750cc) Electric-Start
  - #4: 750/650 Kick-Start Lever, '6304045 before 2006, Chrome
  - #4: 750/650 cc 'IMZ-8.1036-04045-10 Kick-Start Lever from 2006, Chrome
- Kick-Start Lever for IMZ-8.1036 and IMZ-8.1037
  - 36: IMZ-8.1236-04045-10

- Bell Covers and Gaskets
  - Starter Cover, Plastic: IMZ-8.124-18111
  - Starter Cover, Aluminum: IMZ-8.1037-18111
  - Ural Starter Cover Gasket
    - List Price: $25.95
    - motorcycleaccessoriesusa.com

Notice the cute little bend in the kick-start lever for later (from 2006) model Urals to handle the longer CT369B starter motors. Specify color or chrome when ordering.
The gearbox was modified in 1998-1/2 to provide a mounting flange for a starter-motor.
The CT369 is the “A” version of the Ural electric-start motor (shorter version).
Old Timer Garage supplies two types of starter-motors, the 392.3708 for the Ural, which is the shorter version; and the 369Б.3708 for the Dnepr, which is the longer version.

369Б.3708 and 392.3708

The End-Cap of the Later Version (CT369Б) Extends about 25mm Beyond the Electrical Terminals.

Electric Starter, Dnepr (369Б.3708)
Part #: 003.900
List Price: €150.00
(www.oldtimergarage.eu)

Electric starter 12V, Ural
Vendor ID: 003.899
Part #: IMZ-8.124-18075-10
List Price: €180.00
(www.oldtimergarage.eu)
The CT369Б Electric Starters are the newer, longer electric starters for Urals.

Electric Starter (Dnepr)
Part #: 369Б.3708
Vendor ID: 003.900
List Price: €150.00
(www.oldtimergarage.eu)

Electric Starter (Ural Motorcycle 650/750)
Part #: IMZ-8.124-18075
Vendor ID: 1725
List Price: €245.14
(www.ural-europa.com)

Electric Starter - Long. The longer motor is current fitment to all electric start Urals. It can be fitted as a replacement for the earlier short type motor but you will require a new kick-start lever with a greater offset to clear the back of the starter motor.
Part #: F24320/LONG List Price: £245.00
(www.f2motorcycles.ltd.uk)
Suppliers of Ural Electric Starters

Unless the vendor includes the part # (CT369 or CT369Б), it’s hard to tell if the starter motor is long. The best way is to measure the motor from the base of the flange to the end of the end-cap.

Ural Electric Starter
List Price: 4,999 rubles
(www.mc78.ru)
or
Ural Electric Starter
List Price: 4,350 rubles
(750cc.ru)

Starter Motor, 12V
(Dnepr, Ural)
List Price: $120.00
(www.ebay.com)

Starter Motor, 12V
(Dnepr, Ural)
List Price: €189.00
(www.ural-zentrale.de)

Starter, Whirlwind (Electromash)
Part #: 369.3708
List Price: $418.00
(shop.prizmaavto.com.ua)

Starter 369.3708 Whirlwind
(ELECTROMASH)
Vendor ID: 1165-Elmash
Mfgr: ELECTROMASH Kherson
List Price: $621.94
(ruavto.com.ua)
or
OEM Ural Starter for All 750/650cc
Improved, Late Model ( Longer)
List Price: $145
(hotsprings-ar.americanlisted.com)

OEM Ural Starter for All 750/650cc
Improved, Late Model ( Longer)
List Price: $145
(hotsprings-ar.americanlisted.com)
### Common Problems for Starter CT-369 and Possible Solutions

<table>
<thead>
<tr>
<th>External manifestation of faults</th>
<th>Probable cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>When pulling the starter relay, but the starter does not crank or cranks the flywheel slowly</td>
<td>Lack of reliable contacts in places connecting wires to the starter and battery</td>
<td>Check the contacts</td>
</tr>
<tr>
<td></td>
<td>Stuck or worn brushes</td>
<td>Eliminate hang or replace worn brushes</td>
</tr>
<tr>
<td></td>
<td>Dirty collector</td>
<td>Wipe or strip the collector</td>
</tr>
<tr>
<td></td>
<td>Discharged or defective battery</td>
<td>Recharge or replace battery</td>
</tr>
<tr>
<td>Anchor starter spinning but not cranking the flywheel</td>
<td>Stalled freewheel drive starter</td>
<td>Replace drive</td>
</tr>
<tr>
<td>When the starter is audible rattle (gear does not engage with the rim flywheel)</td>
<td>Clogged flywheel teeth</td>
<td>Strip Nick on the teeth or replace a crown</td>
</tr>
<tr>
<td></td>
<td>Clogged starter gear teeth</td>
<td>Clean the drive or replace Nick</td>
</tr>
<tr>
<td></td>
<td>The actuator moves the shaft tightly anchor</td>
<td>Wipe the slot drive shaft and bushing cloth lightly soaked in gasoline, and grease motorists</td>
</tr>
<tr>
<td>After starting the starter motor does not turn off</td>
<td>Jamming drive shaft starter armature</td>
<td>Dismantle the starter and remove the cause of seizure</td>
</tr>
<tr>
<td></td>
<td>Jamming anchor magnetic switch</td>
<td>Remove the cause of seizure</td>
</tr>
</tbody>
</table>

The most common problems include the lack of a starter or weak cranking the flywheel when the solenoid pulls in. The main reason for this may be a problem with the electrical circuit: bad contacts in the starter or the battery terminals, discharging, worn or hung brushes, or oxidation of the commutator.
1998 Ural Deco with Hitachi Starter-Generator

• Late '98 was the first of the Electric Starter for Ural
18-Amp Hitachi Starter-Generator

12-Volt Battery

18-Amp Hitachi Starter-Generator
(18-Amp, 0.9HP GSB107-04A, Five-Terminal)

Charge

Starting

Isolation Switch

Diode

Generator Fault Lamp
(red, lights when battery voltage is greater than charging voltage, extinguishes at high rpm when charging)

Momentary Starter Button
(black, on handlebar)

Voltage Regulator

Up to charging voltage, the winding current is max, as the FF terminal is effectively grounded. As voltage at D+ increases, the relay pulls-in, reducing the winding current by placing a 10Ω resistor in series.

Note: Two wires to handlebar button.
In 1998-1/2, Ural offered electric-start for its 650cc bikes. It used the CT369 starter-motor from the Whirlwind (Vortex) outboard engines, popular in the USSR, and built in Irbit (home-town of Ural).

Notice, starter-motor geared to flywheel.
Up until 2006, Urals used the CT369 electric starters, which allowed straight kick-start levers. After that, the kick-start levers needed to be modified to avoid interference with the longer replacement starter-motor.
Ural 650/750cc Starter/Alternator Circuit (2002-2003) with 35-Amp Alternator

**Right Handlebar**
- Momentary "Start" Button
  - "Start" Button grn / red
  - "Run" Button yel / red
- Rocker-Arm "Run / Kill" Switch "Kill"
  - "Run" Button red
  - "Kill" Button pnk / blk

**Headlight Cavity**
- Neutral Switch grn / red
- Green (Neutral) Switch gray
- Red (Alternator Fault) Switch
- Ignition Switch 6 5 1 2 3
- Ignition Key

**Fuse Block**
- Brakes 4
- Headlites 3
- Run Lites 1
- 9-pin Connector 2

**Front View of Socket or Relay**
- 9-pin Connector
- In-Line Fuse #1 top red
- (back-side) red

**Under Seat**
- RY-115 Electric Start Relay #1 (Normally Open)
- RY-115 Electric Start Relay #2 (Normally Open)
- Starter Motor
- 35 Amp Russian (Hand Grenade)
- Starter Solenoid

**Chassis Ground**
- Pos +
- Neg -

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

(+12V. When Ignition Switch on "Run")
Replacement 12-Volt Starter on My 2003 Patrol

The CT369Б (replacement) required a "bent" kick-start lever to avoid interference.
Ural 750cc Starter/Alternator Circuit (2004-2005) with N-D 55-Amp Alternator

**Right Handlebar**
- Momentary "Start" Button
- Rocker-Arm "Run / Kill" Switch

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

**Fuse Block**
- 6 5 1 2 3

**S-pin Connector**
- (+12V. in "Run" position)

**Ignition Module**
- 85 86 30 87

**Starter Solenoid**
- RY-115 Electric Start Relay #1 (Normally Open)
- RY-115 Electric Start Relay #2 (Normally Open)

**Starter-Motor**
- Pos + Neg -

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

**Chassis Ground**
- +12V.: Engine running and Alternator working.
- 0V.: Engine not running

**Brakes**
- Headlites
- Run Lites

** IGN (ignition)**
- Top

**L (lamp)**
- Bottom

**In-Line Fuse #1**
- 15A for Turn Signal and Neutral Indicator Lamp.
- 5A for Ignition & Electric Start Relays.

**(+12V. when Ignition Switch on “Run”)**

**55 Amp Nippon-Denso Alternator**
- + Main Output

**Fuses**
- In-Line Fuse #1
- Fuse Block #4

**Connector**
- Male 42 Female

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

### Electric Start Relay (Normally Open)

- **RY-115**
- **Starter Motor**
- **Starter Solenoid**

### Momentary “Start” Button
- “Start”
- “Run”
- “Kill”

### Rocker-Arm “Run / Kill” Switch
- “Run”
- “Kill”

### Headlight Cavity
- **10-pin Connector**

### Right Handlebar
- **Green (Neutral)**
- **Red (Alternator Fault)**
- **Ignition Switch**
- **Neutral Switch**

### Fuse Block
- 15A
- 5A
- 15A
- 15A
- 18A

### Nippon-Denso Alternator
- 12V Main Output
- **12 Volt Battery**
- **Chassis Ground**

### Note:
- # in front of wire color is AWG wire size.

- **Pos +**
- **Neg -**
Ural (Урал) IMZ-8.1037 (with Electric-Start)

Starter-Motor and Solenoid

<table>
<thead>
<tr>
<th>#</th>
<th>Part #</th>
<th>Description</th>
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<tbody>
<tr>
<td>5</td>
<td>DIN 912 M10x45</td>
<td>Screw M10-6gx45</td>
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<tr>
<td>6</td>
<td>DIN 912 M10x25</td>
<td>Screw M8x25 8.8 ZN</td>
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<tr>
<td>7</td>
<td>IMZ-8.124-18113</td>
<td>Gasket 1 mm thick , for adjustment of starter crown gear position when required.</td>
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<tr>
<td>8</td>
<td>IMZ-8.124-18112</td>
<td>Gasket 2 mm thick , for adjustment of starter crown gear position when required.</td>
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<tr>
<td>13</td>
<td>DIN 7985 M6x12</td>
<td>Screw M6-6gx12</td>
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<td>14</td>
<td>IMZ-8.1037-18111 Specify color.</td>
<td>Cover</td>
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The RY-115 electric start relay is readily available at auto-supply stores or on the internet.

<table>
<thead>
<tr>
<th>Website</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.compressorworld.net">www.compressorworld.net</a></td>
<td>$6.17</td>
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<td><a href="http://www.rockauto.com">www.rockauto.com</a></td>
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<td><a href="http://www.carpartkings.com">www.carpartkings.com</a></td>
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