

# Ural Electric Starter: Troubleshoot and Repair (updated 01/11)

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This note was formed to help other owners with problems centered on the electric-starter system on 2002-to-2007 Ural motorcycles. The wiring diagrams (schematics) serve several purposes. First they show us the theory behind the alternator / generator / starter circuitry. Next it allows us to properly measure voltages, once we have a feeling for what they should be. It also allows us to trace connections with an ohmmeter or test-lamp. Finally it allows us to trace problems based on known working elements in the path. Having said that, there is a word of caution in that the schematic may not match reality. In some cases Ural may have been in the midst of a change, with dealers still clearing their inventory of older items. In many cases the wire colors may not exactly agree, due to harness changes. Finally many previous owners may have made modifications on their rig, especially in the alternator / generator area.

## When did Ural Add Electric-Start?

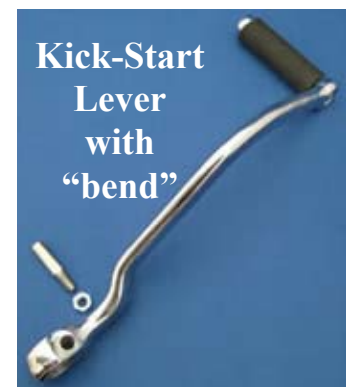
Ural was kick-start only when the bikes were introduced to the USA in 1994 through 1997 (see Timeline Drawing) by Classic Motorcycles and Sidecars, Inc. (CMSI). The first step to make these bikes electric-start was by replacing the original 14-amp Russian alternator with an 18-amp Hitachi starter-generator. The Hitachi solution did not work well and was discontinued soon after it was introduced.

1998 was the introduction of the true factory electric-start option and retrofit. The starter required a larger battery and a 35-amp alternator was introduced at that time. The '98 models were sold both with-and-without electric-starters until the non-starter inventory was sold off. Those 35-amp alternators were like playing Russian roulette and could send a bullet through the heart of your power plant at any given time. In 2004 Nippon Denso replaced the "hand grenade".

## Surprise: Replacement Starters Are Now about ½" Longer

The bell housing (which holds the front, starter rotor-bearing) on our 2003 Patrol starter-motor cracked in half. We were surprised that the replacement starter-motors, that the factory now supplies, are slightly thinner, but about ½" longer. Unfortunately too long to allow the use of the old kick-start lever. Some vendors, such as F2 Motorcycles Ltd, can supply the new, longer starter-motor with a new kick-start lever; the "modified" kick-start lever alone or you can remove the kick-start lever completely. Gene "Holopaw" actually heated up a kick-start lever and bent one for me (good job and nice price). The starter-motor also comes with factory spacer plates (two shim plates) and care must be taken when fitting to ensure the teeth engage properly with the flywheel.

Post-2000 Starter Solenoid



## Front Panel

Modern (>1998) Ural cycles have a modern dash panel set above the headlight, with more warning lights than before and the ignition key relocated to the left-hand headlight support

Alternator failure indicator lamp

Head lamp high beam indicator lamp

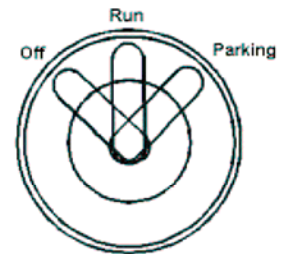


Turn indicator pilot lamp

Gearbox neutral indicator lamp

bracket. Square warning lights replaced the round ones in about 1998.

When the ignition is switched on, the green and red lamps on the instrument board should illuminate. The red “Alternator Fault Indicator” lamp (with battery symbol) indicates that the charging system is malfunctioning (when the engine is running) and needs immediate attention. The green “Gearbox Neutral “ lamp (with large “N”) indicates that the gearbox is in neutral. This lamp might be erratic because of the timid nature of the electrical switch internal to the gearbox itself. The motorcycle “may” be in neutral, but the light may not be on.



## Wiring Diagram and Theory of Operation

Application of voltage starts with turning the Ignition Key to the middle or “Run” position. The Ignition Switch has three fixed positions: Off / Run / Parking (Off: all electrical systems off, Run: voltage is supplied to all electrical systems, and Parking: voltage is supplied to running lights only.) Turning the Ignition Key to “Run” supplies +12-volt battery from pin 2-to-pin 3 of the Ignition Switch.

The +12-volt battery voltage is then routed to the Run/Kill Switch through Fuse #4. It is also sent to the dashboard lights through In-Line Fuse #1. The Ignition Cutoff Switch is a rocker-arm switch with two positions; ignition off (up), and ignition on (down). The Start Button is located below the Kill Switch.

The Starter Solenoid is a large relay and mechanical engagement linkage attached directly on the side of the Starter Motor. Its internal contacts connect the large battery cable (heavy current) directly to the Starter Motor. Electric Start Relay #2 actually energizes the Starter Solenoid. (Auto mechanics and tractor farmers have been known to place a Large screwdriver across the two large lugs to bypass the entire starting circuitry. I don’t recommend this “manly” practice, as bright sparky-hot things can fly around and you leave ugly black spotty thingies on your starter terminals. It’s not for the faint-hearted!)



Electric Start Button

Ignition Cutoff Switch

Once the engine starts and the alternator starts to function, the “+Fault Terminal” voltage will increase to +12-volts, causing the “Red Alternator Fault” lamp to extinguish and Electric Start Relay #1 to open, thus eliminating the possibility of energizing the Starter-Motor while the

engine is running. Opening Electric Start Relay #1 eliminates the current path of the coil of Electric Start Relay #2. Electric Start Relay #2 actually connects the 12-volts to the Starter Solenoid, just like the large screwdriver mentioned before.

### **Trouble-Shooting the Electric-Start**

1. By systematically trying a few things we can trace the path of the +12-volts as it travels from the battery to Electric Start Relay #2 and on to the Starter-Motor.
2. Firmly connect the black (negative) lead of a multi-meter to a clean spot on the chassis (ground). Place the red (positive) lead on the Starter-Motor terminal (terminal with the battery cable attached). The voltage should be +12-volts or greater.
3. Turn on the Ignition Switch to the middle or “Run” position. The headlights and running lights should come on. This also indicates that the battery is good enough to handle a fair load.
4. Both the Green (Neutral) and the Red (Alternator Fault) lamps should be lit, assuming the gearbox is in neutral. (The Neutral Indicator is often erratic because of the poor electrical contact internal to the gearbox. This often gives folks a fit and may not illuminate, but doesn't prevent starting.) The Red lamp indicates that the ignition switch is good, the In-Line Fuse #1 is good, and there is +12-volts going to the Run/Kill Switch.
5. When you turn on the Kill Switch to “Run”, the Electric Start Relay #1 should “click” (located just below the driver seat above the battery). You can rock the Kill/Run Switch back-and-forth to listen to the small click of that relay. Thus we have voltage going to Electric Start Relay #2.
6. Pushing the Start Button should energize Electric Start Relay #2, the Starter Solenoid kicks in, and the motor cranks. If the motor cranks but doesn't start, it's not the Starter Circuitry but an ignition or fuel problem. The above considerations are Only for the Starter Circuitry. If you can hear the Electric Start Relay #2 clicking each time you press the start Button, but the Starter Solenoid is silent, you either have a relay with burnt contacts, a low battery or a bad Starter Solenoid or Starter Rotor. Several folks have needed to take-apart the solenoid to clean it up or to tighten a loose wire.

### **Electric-Start Relays**

The Ural 750 (2000-to-2005) uses two 12-volt starter relays, located below the front-seat and above the battery. With the battery and front-seat out of the way, there is free access to these



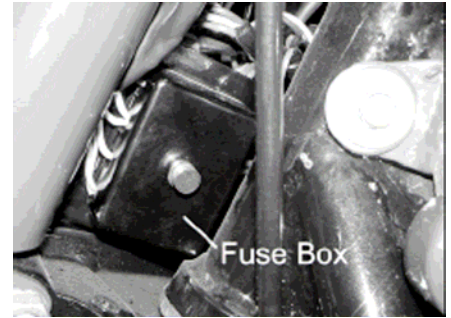
two starter relays (Standard Motor Products RY115), which plug directly into the wiring harness. If both relays “click” properly, there may be no need to remove the battery to gain access to them, as removing the battery can be quite tedious.

Standard Motor Products RY-115, Sorenson MR-78 and Borg/Warner R3012 are all good replacement relays obtainable at any good car parts store (about \$5 on-line or \$10 in the local

auto store). If you don't feel comfortable with these numbers, pull the relay and take it with you to the parts store. The store may have or use a different number and you can compare them. In 2006 the two IMZ-8.1037-18129 relays were replaced with a single relay (part # 441126) manufactured in the US.

### **General Notes on the Repair of Ural Starters**

Try kick-starting, bike should start with the kick-starter. This shows that the rest of the bike is good. Check the fuses and all the ground connections. Go beside the front left fork to remove, clean, replace fuses while checking the wires coming into the block. Intermittent operation could be a bad ground point (earth), a loose connection on your ignition switch or a loose fuse/corroded contact in the fusebox. Often it takes unbolting a ground wire, sandpapering the metal till nice and shiny, and then reattaching the ground. Don't forget to check the tightness of the battery and starter terminals. Open up the right-hand control to look at the switches and all the wires seem, checking for any corrosion on the switch itself.



The Russian spade connectors can be suspect. If so, the connector must be trimmed and a replacement spade or receptacle must be soldered on. Remove the front headlight and look for loose wires and bad connections. On one occasion the mating connector of the 7-pin connector in the headlight cavity was not firmly seated in the plastic connector housing. As a result the electric-start would not work unless the front fork was moved back-and-forth to "giggle" the connection.

### **Attachments**

I have attached Ural Tech Bulletin 2000-01 (Starting Circuit Troubleshooting Guide), which lists several helpful trouble-shooting suggestions, Tech-750-03 (Intermittent Electrical Connections), and Tech Bulletin 2000-06 (Complaints of the Starter Motor Failing to Successfully Engage).

