Warning:
Selenium is toxic. In England its rated as lethal. In the USA its rated as able to make you very sick. Handle rectifiers wearing rubber gloves. Do NOT breathe the smoke from a failing rectifier. Evacuate the area.

Selenium Full-Wave Rectifiers

3-wire

Ground connection
Earth connection
- (minus) battery terminal
Negative battery terminal
Chassis ground
Cathode

4-wire

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Selenium Full-Wave Bridge Rectifier Testing

Drawn by Jon Pardue 2007
Updated 2013

Outside View

Inside View

3-wire

What's Inside to be Tested

AC

Internal Wiring Diagram

BRACKET

Single Diode Schematic Symbol

AC

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Single Diode Schematic Symbol

One-Way Water Valve Comparison

flow going this way is blocked

flow going this way is allowed
One-Way Water Valve Comparison

exceed PIV = permanent damage

restriction in selenium "valve" scrubs off about 1.2 to 1.7 Volts on the way through and generates lots of heat
Diodes lack a perfect reverse "seal"
This is partly why the battery discharges when the bike is not being ridden

Better quality diodes have better "seals".
Sometimes the seal fails, or you get a bad seal from the factory

Result: Poor charging performance
Battery discharges when bike is Off

The "Reverse Bias Test" or "Leakage Test" is how we check the quality of the seal.

Silicon diodes leak a little bit.
Selenium diodes can leak a LOT.
**One-Way Water Valve Comparison**

If the "gate" in a diode sticks open or is damaged, this creates an electrical short circuit. Significant equipment damage can occur.

The battery will have lots of AC Voltage present. Charging current will be lower than normal.

The battery will drain quickly when the bike is Off.
One-Way Water Valve Comparison

If the "gate" in a diode sticks shut no electricity flows in either direction.

This is an electrical open. While no equipment damage will occur, no charging Voltage makes it past this diode.

Charging current will be lower than normal if the other three rectifier diodes are operational.
The multimeter illustrated is available at Harbor Freight. Radio Shack, Wal Mart and auto parts stores also have inexpensive multimeters. Fluke and many others make very high quality meters. For basic testing and troubleshooting on a small motorcycle, an inexpensive meter is fine. No matter what meter you use, **ALWAYS TEST THE METER FIRST.**

The reason is simple: if the meter is not working correctly, you might be fooled by the test results, and tear into your bike to repair something that was not broken.

Here we are setting up the meter for a diode test. This is a very low resistance test, so if your meter lacks a diode test, set it to the lowest resistance scale possible.

**NOTE:** A modern digital meter's diode test is designed for silicon diodes, so it may not test a selenium diode at all. If this is the case, use the lowest resistance scale instead.

During a resistance test, the meter’s internal battery sends power through the probes and measures the resistance of the probes, wires, and the circuit being tested. A good battery is a MUST.

This **basic test verifies the meter is working properly.** This simple test shows the meter probes and wires have 2 Ohms of resistance. Your meter may read Zero Ohms or a few Ohms. These low cost meters may display varying readings during this test.

Meter set to check a diode and displaying 2 Ohms of resistance.

**Shop Note:**
Zero Ohms is a short circuit.
A solid wire measures close to Zero Ohms.
Insulation is an open circuit.
An open circuit = INFINITY on a meter.
There are 8 quick tests required

**The rectifier MUST be disconnected from the bike**

**TEST 1**
Reverse Leakage and Short Circuit

Meter should read infinity (or a very high reading)

LOW READING = BAD DIODE
Replace Rectifier
The diode allows Voltage to flow through it, so the meter is indicating a "short circuit". We expect a good diode to be shorted in this test, so this is all good.

TEST 2
Forward Bias

Meter should read very LOW

HIGH READING = BAD DIODE
Replace Rectifier

If its this good its from the Labs and Workshop of Jon Pardue

http://www.parduebrothers.com
The diode is not allowing Voltage to flow through it in this direction, which is normal. The meter is indicating an "open circuit". We expect a good diode to be open in this test, so everything is testing good.

TEST 3
Reverse Leakage and Short Circuit

Meter should read infinity (or a very high reading)

LOW READING = BAD DIODE
Replace Rectifier
Selenium Full-Wave Bridge Rectifier Testing

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TEST 4
Forward Bias

Meter should read very LOW

HIGH READING = BAD DIODE
Replace Rectifier

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TEST 5
Reverse Leakage
and
Short Circuit

Meter should read infinity
(or a very high reading)

LOW READING = BAD DIODE
Replace Rectifier
Selenium Full-Wave Bridge Rectifier Testing

Test 6
Forward Bias

Meter should read very LOW

HIGH READING = BAD DIODE
Replace Rectifier

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TEST 7
Reverse Leakage and Short Circuit

Meter should read infinity (or a very high reading)

LOW READING = BAD DIODE
Replace Rectifier
Selenium Full-Wave Bridge Rectifier Testing

TEST 8
Forward Bias

Meter should read very LOW

HIGH READING = BAD DIODE
Replace Rectifier

If you can't zoom in to read this at razor-sharp clarity, it's not an original. This original drawing is presented in vector art format at one inch per inch at a size of connected text high by text of two inches. Copyright 2009 by Jon Pardue and protected by a baseball bat.

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